

**IMPACT OF RECREATIONAL GAMES ON
PSYCHO-NEURO-PHYSIOLOGICAL
VARIABLES OF ADULT TRIBALS**

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FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
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CERTIFICATE

Certified that the thesis entitled **“IMPACT OF RECREATIONAL GAMES ON PSYCHO-NEURO-PHYSIOLOGICAL VARIABLES OF ADULT TRIBALS”** submitted by me for the award of the degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my work carried out under the supervision of Dr. Gopal Chandra Saha, Professor, Department of Physical Education, Jadavpur University, Kolkata, West Bengal and that neither this thesis nor any part of it has been submitted before any degree or diploma anywhere/elsewhere.

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*Dedicated to
Loving
Daughter Meghnila,
Son Mansing,
and
To the entire Tribal
Community*

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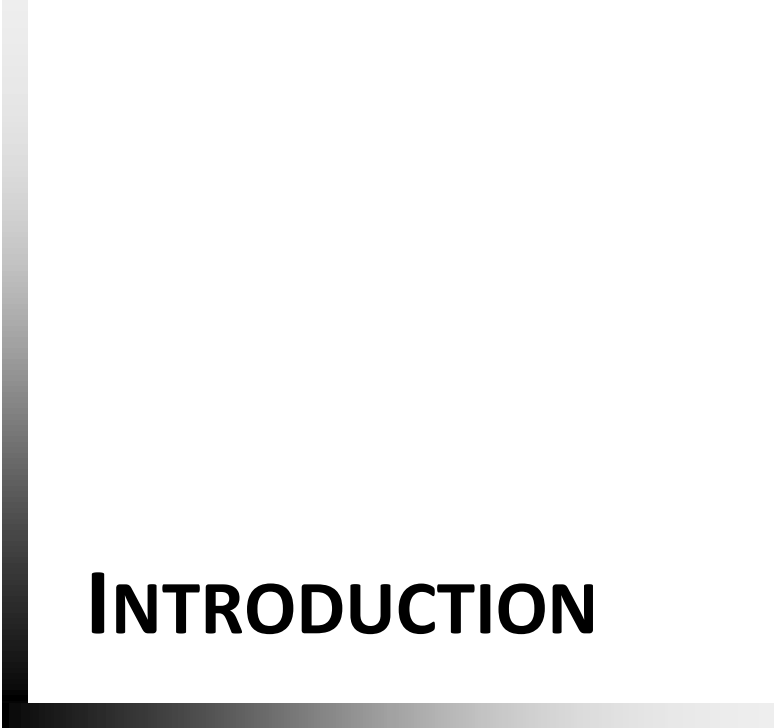
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CHAPTER



1



INTRODUCTION

Chapter I

INTRODUCTION

“Exercise and recreation are as necessary as reading.

I will rather say more necessary,

Because health is worth more than learning”

- Thomas Jefferso (2016)

Life is man's most valuable passion and next in order of value is health. Without health, life is deprived not only of much, if not all, of its usefulness, but also of its joys and pleasures. For, if the body is not in good health, one cannot go about at will he cannot do what he would enjoy doing. Human body is the most superior and delicate creation of God. If we understand the inner systems of the body and use it appropriately it will help us to live for a long time without any ailment. On the contrary, if we don't understand its mechanism and misuse it, it will give us endless trouble and make life a hell. In today's technological age, the world is making progress with tremendous speed in all fields of life. The field of sports and games are no exception to it. The world of games and sports has crossed many milestones, through different types of researches and scientific advancement in general and their application in the field of sports in particular. Sports have emerged in last half of the 20th century and become one of the most compelling social institutions in the contemporary society (Singh and Elvin, 2005).

Normal aging is related with a decline in various cognitive quality and anatomical changes in brain. A number of researchers have reported that aging leads to a linear decrement in gray matter volume (Haug, 1985; Kemper, 1994; Morrison and Hof, 1997; Uylings et al., 2000) Michielse, et al. (2010) reported significant effects of aging on white matter (WM), gray matter (GM), cerebro spinal fluid (CSF) volumes and selective effects of aging on structural state of different white matter tracts. WM of the prefrontal region was the most vulnerable to aging, while temporal lobe connections, cingulum, and parieto-occipital commissural connections appearance relative preservation with age.

Research indicates that neural functioning is affected by aging where generally neural functioning improves up to adulthood after which there is a progressive decline. Physical changes in the brain such as aging result in changes in volume of whole brain, cerebrospinal fluid as well as grey matter where a progressive increase has been observed up to adulthood and thereafter, a gradual decrease occurs (Courchesne, et al., 2000). There is multiple evidence that specific psychological, social, and physical protective factors are associated with improved health in later life (Marmot, 2004). Among these factors, control beliefs (Krause and Shaw, 2003), social support (Guralnik and Kaplan, 1989) and physical exercise (Fries, 2002) are systematically identified as predictors of functional health.

Social interactions concern a combination of supportive and stressful experiences. High quality social relationships are those in which support is relatively high and strain relatively low. Social support is associated with health in that those who are socially integrated and experience positive relationships are better off than those who are isolated or involved in strained or disagreeable relationships (House et al., 1988). There is also longitudinal evidence for the relationship between positive social exchanges and structure of physical disability (Mavandadi et al., 2007), and socially vulnerable elderly are more likely to show disability, frailty, and higher mortality risk (Seeman et al., 1995). The mechanisms that have been considered include physiological factors such as stress hormones, immune functioning, and inflammatory processes that may be change for those with low social support or social isolation (Andrew et al., 2008). Moreover, those who have supportive relationships are more likely to reap the benefits of a more active, reserved and healthy lifestyle (Berkman et al., 2000).

The physical and cognitive decline that occurs during aging translates to ability to carry out daily living tasks with consequent impacts on social relationships and quality of life. This has prompted the design of programs for this population sector targeted at improving functional health and encourage the independence of the adults in their environment. In this context, routine physical exercise plays a leading role in the life quality and expectancy of adults (Blain et al., 2000; Katula et al., 2008; Poon and Fung, 2008; Vogel et al., 2009).

Good health means that all organs of the body are functioning efficiently. The important proverb is, 'Health is wealth', 'if health is lost everything is lost', and is realized more in its absence than by its presence. Youth is not a time of life, it is a state of mind. The importance of health is more than education, money and other material comforts. Happiness is informally concerned more with good physical and mental health than other outside factors. At this stage, we need to know the essential situation to keep ourselves healthy (Dev, 1999).

A lack of agility and dynamic balance (gross motor abilities) is a significant risk factor for loss of ability and progressive the risk of falls. Balance also affects daily living activities such as standing, bending, climbing stairs, walking or acknowledge to external stimuli (Sturnieks et al., 2008). The reason for this is the progressive impairment in neurophysical skills that occurs with age, impairing sensory-motor functions and producing deficiencies in perception, muscle and cognitive function, and thus affecting balance and the risk of falling (Sturnieks et al., 2008). Regularly practicing some form of physical exercise reduces the risk of decline (Howe et al., 2007), essentially because of developed muscular strength, agility, dynamic balance and coordination (Blain et al., 2000; Karinkanta et al., 2009; Orr and Singh, 2008) and also helps preserve cognitive skills (Angevaren et al., 2008; Blain et al., 2000; Brisswalter et al., 2002; Colcombe and Kramer, 2003; Liu-Ambrose and Donaldson, 2009; Williamson et al., 2009). Indeed, different exercise programs seem to achieve progressive changes in physical condition and cognition in adults (Berryman et al., 2014). However, the physiological pathway of these results displays a large variety of mechanisms linked with their cognitive effect, which nowadays should be clarified (Berryman et al., 2014; Voelcker-Rehage et al., 2010). Some of these indicators are simple reaction time (S-RT) (Dustman et al., 1984), choice reaction time (C-RT) (VanBoxtel et al., 1997), or visuospatial tasks (Shay and Roth, 1992), which are considered as key markers of the functional ability of the adults (Colcombe and Kramer, 2003).

The components of health-related fitness are determined by several variables including the individual's activity and level of habitual activity, diet, and heredity. Individuals who do not exercise regularly are at greater hazard of developing hypokinetic diseases such as coronary heart disease, hypertension, hyperlipidemia, obesity,

diabetes mellitus and so on. Moreover, there is highly indicative evidence that genetic variation accounts for a essential fraction of the individual differences in cardio respiratory endurance and its response to exercise (Boucher and Malina, 1999). The majorities of the health-related fitness elements are also influenced by genetic factors and are considered to be the result of the interaction between environmental and genetic effects. For example, heritability around 30% is generally reported for blood pressure (Ward, 1990), and the sensitivity of blood pressure to environmental cause is related to the genotype (Hamet, 1995).

The benefits of physical exercise for health are widely credentialed (Boyle et al., 2007). Those who engage in regular exercise are likely to reduce or avoid disability due to the positive effects on, for example, cardiovascular and pulmonary functioning, bone density, and muscle mass (Fletcher et al., 1996). The exercise pattern should be preserved year-round, year after to keep the benefits. This may look like an impossible task with personal activity needed for out weighting the possible reward. But, once a regular practice of exercise is established, activities become easy and natural. In fact, many people don't maintain their regular level of exercise (Vodak, 1995).

In addition, epidemiological research indicates that physical activity decreases with age (Stephens et al., 1994). Moderate regular exercise has been shown to develop the physical health (Blair et al., 1996) and mental well being (Bennett and Morgan, 1992) of elderly individuals. Deteriorating health that often accompanies the aging process has been related with a decrease in physical activity among adults' individuals (Wolinsky et al., 1995). Many psychological theories have been utilised to explain exercise behaviour. Many of these theories have been altered specifically for populations of older individuals (Herbert and Teague, 1989). However, knowledge about exercise has been associated with predicting participation and support to a structured exercise programme among older adults (Howze et al., 1989). Knowledge may be important in the initial adoption of exercise (Dishman et al., 1990). Appropriate exercise behaviour such as correct technique, intensity and equipment needed for specific activities may be essential for programme continuation with the adults. Safe and appropriate exercise would likely decrease the falls of injury and increase the capability for enjoyment of the activity (Sedgwick et al., 1988).

In this regard, physical activity is one of the most important resources to rising health and quality of life in adults, which has been discovered by different studies (Sansano et al., 2019). In addition to this, many authors have shown that physical exercise improves the functional quality of adults (Nawrocka et al., 2019) as well as their quality of life (Vagetti et al., 2015).

According to Oxford Dictionary ‘tribe’ refers to a social division in a traditional society consisting of linked families or communities with a common culture and dialect, and a taxonomic category that ranks above genus and below family or subfamily. Tribal are isolated from the main stream of population. They are economically and educationally inverted, suffer in extreme famine, habitation in remote inaccessible hilly terrains; they maintain constant touch with the natural environment. The Santhals of rural and urban India are by far the largest tribe in India and also in Bengal. In West Bengal the Santhals are the majority tribe and comprise more than 50 percent of the total scheduled tribe population. Other tribes include the Oraon, Munda, Bhumij, Kora, Mahali, Lodha, Bhutia and Malpahariya. Tribal communities form a small but an essential and ancient group of our population. Tribes have been the original primitive inhabitants of our country, who were driven from the productive plains to the more inaccessible, remote, unfavorable slopes, hills and forest by subsequent waves of invaders (Singh, 1983).

In 2002 the Indian constitution identified the Santhals as “scheduled tribals.” They are the third biggest scheduled tribe in India. Indian culture emerges from four racial groups: Austro-Asiatic, Dravidian, Tibeto-Chinese and Aryan (Somers, 2002). The Santhals descend from the pre-Dravidian or Kol people who migrated to the regions of Jharkhand, Chattisgar, Orissa and West Bengal about three centuries ago, preserving to a broad extent their language, culture and traditions. It is contemplated that a region called Sant existed south of the Santhal Parganas in Jharkhand, which may have been their original habitat. According to British documents, Santhals were brought by Bengali traders in the first quarter of the eighteenth century and continuing to the mid-nineteenth century to what was then a much bigger Bengal, to clear forests and cleanse areas of the lush Gangetic plains for the Bengalis and the Rajas. In return they received one tenth of the land they cleared, leading them to determine there permanently. The land was used primarily for wet-rice agriculture. It led to their

drifting from a hunting-gathering society to an agricultural society. Santhals are one of the biggest tribal groups in South Asia and the biggest tribe in India. In West Bengal, 5.5 per cent of the total population is tribal. Among them, nearly 51.8 per cent are Santhals. Santal is an indigenous ethnic group of Indian subcontinent and lives in Jharkhand, West Bengal, Bihar, Odisha, Assam, Bangladesh and Nepal. Santhals are the biggest primitive community in Indian subcontinent (Archer, 1974; Dhargupta, et al., 2009, Ministry of Home Affairs, 2017). Tribal population of India is around 8.2 per cent of the total population, of which 0.59 per cent are Santhals (Datta Banik et al., 2007; Hembrom, 2000).

Santhal life in Paschim Medinipur and Bankura districts of West Bengal bring out a very clear picture of fluctuation from one place to another. First, gradual process of Hinduisation in the form of various Bhakti-cults, in which Vaishnavite inclination are reflected, is a peculiar Bengalee-Hindu peasant culture. Second, a line of development has taken place in some contact positions where the Santhals, including other tribals converted to Christianity, got the possibility of better education and economic betterment provided by many Christian missionaries. This directly contributed, to a great extent, to the awakening of a sense of consciousness among the tribals about their deplorable conditions. Directed with an aim of striking a religious identity of the Santhals in a region influenced by widespread Hinduism and to some extent haunted with conversion to Christianity of the Santhals, “Sari dharma” (a religion based on ‘truth’) has made a divergence between three groups of Santhals: Saf –hor: Following Saiva cult or Local Hinduism represented by the Deswali Majhi Um–hor: Christian Santhal Bonga–hor: Followers of “Sari-dharam”, believers of traditional Santhal gods (Bhowmick and Jana, 2004). However, according to Dr. George Somers, who lived with the Santhals for thirteen years, they refuse to take part in the Hindu caste system (Bose, 1985).

This very nature of living of tribal people, generally designed them so much hardy in physique, make them sought and powerful in their functional ability and configuration their unbeaten mental make-up and high resistance power which independent them than that of the non-tribals people. Among these tribals communities, Santal tribals are found to be more advance and identified as develop community whose promise holding activities in various aspects drawing attraction of modern society. Further in

India various tribal communities are in different stages of improvement but they are still backward in comparison to those who are so-called advanced people. Therefore, it is possible that there may be greater divergences in body composition, hemoglobin content, blood pressure, kinanthrometric measurement etc. between tribal and non tribal (Rowney, 1974).

It is know that tribal lands are brought in the lap of open natural space and outdoor setting of dynamic life. Because of this conductive environment their physique and physical abilities to perform physical natural activities are excessively developed. In India some gross differences in physical, physiological, food habits, dress, customs and way of living and cultural areas are recognized between tribal and non-tribal people. There are body surface areas, food habit, exercise, social, cultural and genetic components which in turn prompt the sports performance (Rampotti, 1960).

The Santhal tribes are the oldest tribes in Indian shipped from the Pre Aryan times. The Santhal tribes which are still found in some regions of eastern India are West Bengal, Orissa and Jharkhand. There are many recreation activities, which is still observed by the scheduled tribe communities of West Bengal for example; Folk Dance, songs, festivals and playing traditional music equipment etc. The ethnic tribal are unique though decreased in a population they still owe their own culture and lifestyle. Music, dance and instruments are totally distinctive and popular as one of the biggest and ancient tribes belonging to India. Santhal dance is observed in a group of girls and boys accompanied by instruments Dhol, Flutes, Pipes and Cymbals. In West Bengal Santhals involve the jungle areas around Midnapore, and are poorly tolerated by the laborers in the plain regions of West Midnapore and Bankura district. However, according to Walter Hamilton, the Santhals are “a mild, sober, industrious people, and remarkable for sincerity and good faith” (Bose, 1985).

Further, the technological advancement in all spheres of life has bring about a lot of free and leisure time after working hours; at the same time the advancement in recreational Equipment and Accessories, like electronics and tech gadgets, Video-CD games, computer games and smart phone games has made the person least interested in physical activity resulting in so many physical, mental and emotional troubles. To counteract both aspects, the utility of available time and leisure time in a constructive way and to make a person more physically progressive in order to allow this growth

and development to take place proportionately, effective recreation activities, other than passive ones are a must (Singh et al., 2004).

Recreation means to regain lost vigour and to get a sense of joy, rejuvenation and satisfaction. Recreation is life itself. Without recreation life is inconsequential. The modern age is full of complexities and people in order to survive has to do lot of physical and mental work, resulting in fatigue. Through recreation people can retrieve the lost vigour or energy. Recreation is concerned with those activities executed by an individual during leisure time or at hours not at work. Hence it is often referred to as leisure time activity. Recreation education is aimed at teaching people to promote their free time and leisure time in a structural manner. To achieve this aim and to have worth as recreation, activities must be appropriate to one's physical, mental, emotional and social needs. In other words, it involves a careful selection of activities for the utility of free time in a healthy way (Singh et al., 2004).

Among all the people and in all stages of history, man has recovered outlets for self expression and personal development in pattern of recreation which have a striking similarity. Recreation is a common culture of all people, although its aspect takes varied forms. It is nature's way of affording outlets to the great biological desire for activity and the means of acquiring skills required in later life. Competitive and recreational sports participation can have a assertive effect on the growth and development of children with both congenital and acquired limb deficiencies. The adverse can compete successfully if the activity is safe, even provides a reasonable degree of challenge (Charles et al., 2000).

Physical education teachers and instructors can provide quite a large number of minor games as warming up activities and incorporate them in conditioning programmes. The beauty of minor games consist of their variety and variation and the short break they administer to the players within and after very strenuous and effortful physical activity. A small game may be called by different names in different places; for instance "Chor-Sipahi or Sewing up the Gaps". The essential thing is the content and the structure. Effort, then, has been made to contain the traditional names and to allude to other names of the same game popular in different places. Classification whatsoever is only a formality. The intensity of enjoyment is heightened and the positive feelings reinforced when all the players in a team or a group are really "in the

games". Neat conduct and excellent organization of the games would acquire each and every participant (Joseph, 1991).

Physical activities and games are the most important elements that emphasize the acquisition of sequential movement skills and developed physical competency based on the unique development level of the individual. It recognizes and incorporates the many improvements that systematic, sensitive teaching can make to both the cognitive and development of the individual. Developmental physical education promotes the uniqueness of the individual and is based on the basic proposition that although motor development is age associated, it is not age dependent. As a result, teacher decisions concerning what to teach it and how to teach are based primarily on the appropriateness of the activity for the individual and only secondarily on the appropriateness of the activity for a certain age group. Additionally, the inclusion of specific movement activities is considerably effected by personal levels of physical fitness, cognitive development and affective development (Sharma et al., 2004_{a, b, c, d}).

The human want for change and relaxation after work is acknowledge but it is sought to attribute that diversion and amusement do not show the right way for its enjoyment. At best, they are incomplete remedies accepted for lack of better ones. Recreation is the answer not only affording change and relaxation but a balanced way of life through inventive self-expression. One more synonymous term for enjoyment giving human experiences is entertainment (Kumar, 2014).

Leisure formed an integral part of the seven-day week and the word 'recreation' shed its old association. Cities built playgrounds and parks; professional recreation associations sprang up; and the schools curricula modify to include physical activity and recreation. A new impetus emanated from the age of automation, and provided an explosive revaluation of the belief of and the need for recreation in prosperous society. By the time that the impact of the Scientific modification was felt, increasing number of individuals in all walks of life was awakening to the value of recreational activities (Gold, 1973).

Leisure and Recreation, though closely related are not synonymous. "The emphasis in leisure is on the component of time; recreation refers to one way leisure may be spent". One can spend leisure in many patterns other than the pursuit of some forms

of recreation. Some leisure may take the form of idleness. Recreation in socially satisfactory sense involves constructive activities for either the individual or a community. "The common denominator in recreation is self expression". In recreation the essential element is not what the person does but the spirit in which he does it and the satisfaction derived. Although in a broad sense most pattern of recreation are free time activities and many leisure time pursuits have some recreational values (Neumeyer and Neumcyer, 1958).

Outdoor recreation attributes to well being done on a regular basis. There are several types of activity involving walk up, brisk walking, bird observation, socialised with fellow mates, picnic, nature study, hiking etc. Driver and Knopf (1976); Driver and Cooksey (1977); Driver (1985); Godbey et al. (1992); Tinsley et al. (2002); Kacznski and Henderson (2007) have found beneficial effects of outdoor recreation in solving the deteriorates of stress and obesity. Stress reduction appears to be an important improvement reported by older visitors to local parks (Godey and Blazey, 1983). Negative moods decreased after spending time in a parks and a park users reported lower levels of anxiety and sadness (More and Payne, 1978).

With advanced age comes a deteriorate in sensorimotor control and functioning. These declines in fine motor control, gait and balance influence the ability of adults to perform activities of daily living and preserve their independence. The causes of these motor reductions are multi-factorial, with central nervous system declines and effects in sensory receptors, muscles and peripheral nerves playing a role. The literature on age-related differences in neural control of movement has not elicited as quickly, but numerous studies have been conducted to date (Harada et al., 2009; Heuninckx et al., 2005, 2008; Hutchinson et al., 2002; Mattay et al., 2002; Naccarato et al., 2006; Riecker et al., 2006; Ward and Frackowiak, 2003).

Motor performance deficits for adults observe to be due to decline of the central and peripheral nervous systems as well as the neuromuscular system. Motor performance decreases include coordination difficulty (Seidler et al., 2002), developed variability of movement (Contreras-Vidal et al., 1998; Darling et al., 1989), slowing of movement (Diggles-Buckles, 1993), and obstacles with balance and gait (Tang and Woollacott, 1996) in comparison to young adults. These dysfunction have a negative effect on the capacity of adults to perform functional activities of daily living.

Motor performance declines with aging are likely due in part to changes in peripheral structures such as sensory receptors, muscles, peripheral nerves, joints, etc, as well as affect of central nervous system. In the past, the literature has focused primarily on peripheral mechanisms; in recent years, however, the focus has alteration to the investigation of more central mechanisms. Here, we exclusively review age differences in sensory and motor structures within the central nervous system that have been related to motor performance deficits. We also highlight the fact that adults rely on more widespread central nervous system involvement for motor control than young adults. In addition, hand-eye coordination is associated as one of the most significant sensory-kinetic mechanism which controls eyes and hands in a coupled performance unit (Kovari et. al., 2020).

Age-related deteriorate of the cerebellum (Raz et al., 2001, 2005) and the proprioceptive system (Goble et al., 2009) may associate to deficits in multi-joint coordination for adults. Central mechanisms of the elderly have some deficits that affect the engagement of movement and control with visual guidance (Welford et al., 1969). A longer period of time is occurred to initiate the movement and to guide the movement in elderly compared to young people (Fitts, 1992). A number of irregularities in the kinematics of movement have also been influenced in older people (Morgan et al., 1994). Systematic age differences in movement-to-target reaction times were found. The deleterious impacts of age in eye-hand coordination and motor control of the upper extremities may decrease functional ability, physical activity and self care in the adults.

Locus of control, a construct within social learning theory, provides that a behaviour such as exercise should be more likely to persist if individuals have a feeling that they possess some individual control over their health. Conceptually, adoption of exercise would be easier for those with an internal locus of control because of their perception of control over their environment. Individuals with an internal locus of control would, in theory, experience fewer perceived external obstacles to physical activity (Rotter, 1966).

Leibniz (1646-1716) was probably the first philosopher who formally recognized the importance of social experience for one's perceptions of satisfaction with his life. It was the 18th century, when some other philosophers contributed to the idea that

satisfying any acquire led to increased satisfaction with self, as whole. John Stuart Mill got the credit of putting the bases for considering some satisfactions as being more essential than others. Spencer (1893) further clarified the meaning of satisfaction by stating that man could not had a satisfying life if the environment did not contributed satisfaction for his needs.

One of the most important features of human existence has been attributed with seeking happiness and throughout the course of history, philosophers, thinkers and reformers have related to highest place to it. Even then for decades psychologists have largely neglected positive part of life satisfaction. Although its contrary was explored in depth (Diener, 1984), only recently concerns have been left to elicit such aspects as well being, desired happiness, life satisfaction, quality of life and pleasantness. The philosophical literature both Western and Eastern, are reptile with attributes of the ultimate good and everlasting bliss, so much so, that even a layman attaches it such a place which he aspires to achieve during his later life.

Life satisfaction is the internal feeling of happiness, which effected by a number of components. The relative importance of these components depends on the individual and individual's age. Dickie et al. (1979) reported that happiness at different periods in the adult years was remembered as being cause by family, marriage, good health, achievement, occupation, richness of cultural life, realism of self concepts, total service of society, interpersonal relation i.e. social support etc. While unhappiness or dissatisfaction was related to illness, physical injuries, death of a loved one, unsuccessful work experiences and failure to ultimate goals.

The consequent of self-esteem have attribute bearing on how people beliefs their daily lives. These who feel good about themselves contribute to be happy, healthy, successful, and adaptive in stressful situation. In contrast, people with low self-esteem are more anxious, depressed, hopeless about the future, and prone to failure (Brown, 1974).

It is a physiological fact that the human organism desires stimulating exercise. When the whole body is subjected to regular physical activity, requiring vigorous effort on the heart, lungs and muscles, the general efficiency of physiological functions is being improved. Research now strongly has the theory that regular and strenuous exercise

helps to develop the heart healthy and may protect cardio-vascular diseases. A physically fit heart, beats at a lower rate and pumps more oxygen, which indicates the substantial increase of capacity to do more physical work. People who keep fit greatly grow their fullness of living. With advancing age, deteriorate physiologic changes occur in almost all the systems of the body. These changes do not due to disability in themselves; however aging decreases the body's capacity to with stand stress as homeostatic mechanisms decline in terms of functional capacity and ability to respond to stress. Human ageing is associated with a progressive decline in physical and physiological function and this decreased capacity leads to a various of changes in the adult's life including a destruction independence in functional tasks (Young, 1997).

Participation in recreational games can be used as a means by which to increase beliefs of wellness and health benefits for adults. Recreational games refer to physical activity, such as exercise, various recreational activities, or small games, undertaken during leisure time. Accumulating evidence suggests that, by participating in leisure-time physical activity (LTPA), older adults can reduction negative psychological symptoms, including stress and anxiety, and improve their psychological well-being and life satisfaction (Hamer et al., 2009; Lampinen et al., 2000). For example, Poon and Fung (2008) found that older Chinese individuals who lived in Hong Kong developed psychological well-being as a result of their engagement in LTPA.

It is further assumed that engages in regular recreational games are likely to live longer, have higher productivity over his working life and have leads to optimism, life satisfaction, psychological well-being and positive affect and improved quality of life during his life tenure. If due importance is given to the tribal people and imparting various recreational games along with the proper loading and adaptation which may result in remarkable improvements are not just limited to the physical health, but also include the psychological health, including the cognitive, social, affective, and moral development.

Therefore, the research scholar is interested to investigate the degree of importance of the recreation games, which are essential to attain an outlet for self expression, for release of tension, stress and for the attainment of satisfaction in life for adult tribals who are socially ignored and disregarded due to their backwardness. It makes a path for adult tribals to contact with others and form a relationship which offers

momentous opportunities to perform and expand social skills through activities and thereby such study was being undertaken.

STATEMENT OF THE PROBLEM

The main purpose of the study was to determine whether recreational games would have greater impact on selected Psycho-Neuro-Physiological variables of adult tribals.

Hence the present researcher intended to take this study for investigation and stated the problem as under: **“IMPACT OF RECREATIONAL GAMES ON PSYCHO-NEURO-PHYSIOLOGICAL VARIABLES OF ADULT TRIBALS”**.

OBJECTIVES

The study was conducted with following objectives:

- To determine the influence of Recreational games on selected Psycho-Neuro-Physiological variables such as, Self Esteem, Life satisfaction, Locus of control, Self efficacy, Illusion, Tactile Sense, Hand Eye Co-ordination, Gross movement of hands, finger and arms, Depth Perception, Reaction time, Resting Heart rate, Systolic blood pressure and Diastolic blood pressure.
- To formulate a suitable training schedule on Recreational games for the adult tribals.
- To identify the status of the subjects on Psycho-Neuro-Physiological abilities.

HYPOTHESES

Following hypotheses were formulated to conduct the present study:

- a. It was hypothesized that there would be no significant improvement due to recreational games training in selected Psycho-Neuro-Physiological variables among male adult tribals.
- b. It was hypothesized that there would be no significant improvement due to recreational games training in selected Psycho-Neuro-Physiological variables among female adult tribals.

DELIMITATIONS

The present study was delimited to the following condition:

- This study was delimited to 40 male and female adult tribals of 50-55 years of age. Out of 40, 20 in each category were selected from Bankura district in West Bengal.
- This study was restricted to sixteen weeks of recreational games training Programme.
- This study was further delimited to following Psycho-Neuro-Physiological variables such as, Self Esteem, Life satisfaction, Locus of control, Self efficacy, Illusion, Tactile Sense, Hand Eye Co-ordination, Gross movement of hands, finger and arms, Depth Perception, Reaction time, Resting Heart rate, Systolic blood pressure and Diastolic blood pressure.

LIMITATIONS

The present study was conducted under the following limitations:

- In this study the personal lifestyle, the diet, the daily habits and other activities were recognized as a limitation.
- The heredity and previous fitness experience of the subjects were treated as the limiting factors of this study.
- Sociological aspect of their day-to-day life interaction with their environment was not considered for this study.
- Motivation, attitude and interests of the subjects were also limiting factors for the present study.
- In this study climatic condition and Environmental temperature could not be controlled.
- Financial condition and time were also not considered in this study.

DEFINITION AND EXPLANATION OF THE TERMS

● RECREATIONAL GAMES

The recreational activities particularly group games are used which require a little change of formation as possible. It is sheer waste to use a circle game, then a line game, then a double circle game and then a really race. The time involved in taking new formations can a far better spent in active engagement in play (Jain, 2002).

Recreational games are often defined by their structure and form. It can be thought of purely as discretionary time but we can also think about it as the kinds of activities that we engage in during our free time. Recreational that is thought of as a freely chosen, organized, non-work activities pursued for personal and social benefits (Kelly & Freysinger, 2001).

● TRIBAL

The term tribe is used in many different contexts to refer to a category of human social group. A group of proto-asteroid human races, small sized population, economically, educationally, socially and culturally backward people and they are usually recognized by their ethnics index is called tribal (Toite, 1971).

SIGNIFICANCE OF THE STUDY

This study was found significant in following ways:

- This study would be helpful for the adult tribals to improve their selected Psycho-Neuro-Physiological abilities.
- The study would also enhance the knowledge base and help adult tribals for better understanding of fitness and the effect of recreational games.
- It would help to improve the role of entertainment and knowledge for utilizing recreational games as an instrument for the utility of free time in a healthy way for the adult tribals.

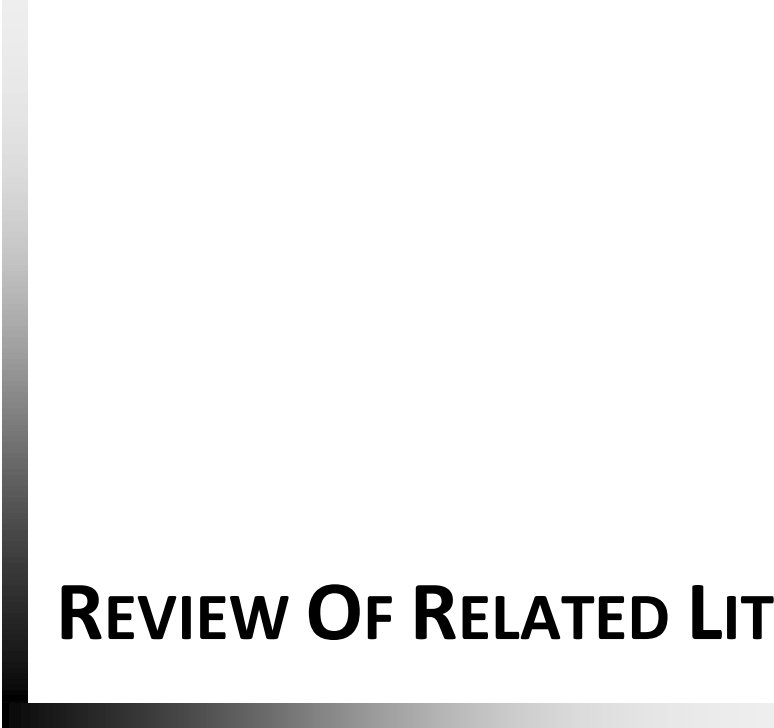
- This study would be helpful for the adult tribals to improve their work quality and benefited by identifying their own fitness level understanding the need for recreational games.
- The present study will help to understand the role of recreational games to motivate the participants because of the enjoyment and satisfaction which it brings directly to him.
- The findings of this study will contribute to the literature of physical education and might introduce new area of research for future researchers.



CHAPTER



2



REVIEW OF RELATED LITERATURE

Chapter II

REVIEW OF RELATED LITERATURE

The review of literature is instrumental in the selection of the topic, formulation of hypothesis and deductive reasoning leading to the problem. It helps to get a clear idea and supports the finding with regard to the problem under study.

The researcher came across several books, periodicals and journals and published thesis, while searching for relevant facts and findings that were related to this present study, such as those were given below for the better understanding and to justify the study. It also helps the investigator to go deep into the problem at hand and it helps to study the different variables of the problem.

STUDIES ON PSYCHOLOGICAL VARIABLES

- ❖ **Rotter (1966)** examined that internal versus external control of reinforcement (I-E) refers to the extent control of reinforcement (I-E) refers to the extent to which an individual feels that he has control over the reinforcements that occur relative to his behavior. Reported in his original monographs that internals actively resist being conditioned or manipulated.
- ❖ **Bernardelli et al. (1983)** in their study examined the relationship between I-E LOC, career maturity and occupational information seeking. Results indicated that LOC and academic achievement are positively related and more internal beliefs are associated with greater academic achievement. The results tended to be stronger for adolescents than for adults or children. Also the relation was more substantial among males than among females. Stronger effects are associated with specific LOC measures and with standardized achievement and intelligence tests.
- ❖ **Denga and Daniel (1984)** examined the relationship between LOC and their occupation choice behaviour among 200 male high school students by asking subjects to complete Rotters I-E LOC scale and the motivation for occupational preference scale. Findings indicate that internal LOC individuals are passively

dependent on external factors such as chance and good fortune to influence their occupational choice.

- ❖ **Bhanumati (1984)** conducted study in traditional physical education and folk dance of Manipur. For the collection of information she used questionnaire technique, visitation and personal interview. It was inferred that there existed a rich tradition of recreational sports and folk dances in Manipur with different varieties. She classified these activities viz. recreational activities, martial art activities and major game activities. These activities were found popular among youth, children and adults. There appeared to have the arrangement of the training in traditional sports and folk dances in Manipur.
- ❖ **Der-Karabetian and Gebharbp (1986)** investigated a study “Effect of Physical Fitness Program in the Workplace” This study examined the effect of employee's participation in a physical fitness program in an industrial workplace on: job satisfaction, body image, and sickdays, using a pre-post matched control group design. Experimental and control groups (no's = 23) were measured on the three dependent variables at the start of the fitness program and six months later. Analyses of covariance showed significantly higher job satisfaction, more positive body image, and fewer sick days in the experimental group.
- ❖ **Norris et al. (1992)** determined whether participating in physical activity affects psychological well-being in an adolescent population, 147 adolescents completed self-reports of exercise and psychological stress and well-being. Adolescents were assigned to either high or moderate intensity aerobic training, flexibility training or a control group. Aerobic fitness levels, heart rate, blood pressure and self-report of stress and well-being were measured prior to and following 10 weeks of training. Subjects undergoing high intensity exercise reported significantly less stress than subjects in the remaining three groups. The relationship between stress and anxiety/depression/hostility for the high intensity group was considerably weakened at the end of the training period. For the remaining subjects, however, this relationship was, if anything strengthened.
- ❖ **Amelia (1994)** investigated the following four sets of relations: (a) the relation between training in metacognitive development and the gains in metacognitive

knowledge among college learners, (b) the relation between metacognitive knowledge and reading and writing proficiency among college learners, (c) the relation between metacognitive knowledge and college learners' locus of control, and (d) the possible combined relation of metacognitive knowledge and locus of control on reading and writing proficiency. A within-subjects repeated measures design was used. Both prior to and after the training. Results indicated that while participants gained in metacognitive skill development, such gains did not predict gains in reading comprehension or in writing proficiency. Locus of control was not shown to be a predictor of gains in metacognitive skill development.

- ❖ **Nunn (1995)** examined effects upon achievement and locus of control of at-risk middle school students (n=103) enrolled in a yearlong learning styles/strategies intervention course. Results indicated significant improvement within the at-risk intervention group, in grade point average and locus of control, i.e. decreased externality. Implications and further research is discussed.
- ❖ **Adalbjarnardottir (1995)** examined the role of social anxiety, social withdrawal and locus of control in the developmental level of Interpersonal Negotiation Strategies (INS) when resolving hypothetical conflicts in a short-term longitudinal study. Applying a balanced design, 96 children aged eight and eleven from eight classes participated in the study. At both assessments results indicated that sociable children were more likely to exhibit greater competence in INS than socially withdrawn children. However, both concurrent and longitudinal analyses indicated that degree of social anxiety tended to influence this relation. Among less socially anxious children, the sociable children did exhibit greater INS competence than more socially withdrawn, but this relation was not revealed among the more socially anxious children. On the whole, children who showed internal locus of control were more competent at INS than children with external of control.
- ❖ **Bempechat et al. (1996)** in their study on “attribution of predictors of mathematics achievement” studied the relationship between attributions for success and failure and mathematics achievement in poor African - American, Hispanic, Indochinese and Caucasian 5 and 6 grades. Students completed the portion of the Sydney Attribution Scale and the Wide Range Achievement Test

for mathematics. Results indicated that the four groups had similar patterns of attributions and that ability attributions were associated with high achievers. Specifically, across ethnic groups, high achievement was associated with attributing success to ability and not attributing failure to Lack of ability. High achievement was not related to effort attributions. Findings are examined in the context of cross ethnic and cross- cultural research.

- ❖ **Kim (1997)** examined the purpose of research was to determine the extent to which the level of leisure participation and acculturation contribute to life satisfaction among elderly Korean immigrant. A sample of 127 Korean born persons age 60 and older was recruited from several social service agencies located in Queens, New York and surveyed on their participation in leisure activities, acculturation level, life satisfaction and demographic background variables. The major findings exposed that respondents tended to have low levels of participation in leisure activities, they also had low levels of acculturation, and low level of satisfaction. Participants tended to participate in home and social activities in much more than other form of activities, sports and outdoor activities were participated in the least of all, sex, age and health status were significant influences on all forms of leisure participation. Participation in leisure activities was positively related to the individual's level of acculturation and life satisfaction. Life satisfaction and acculturation were positively related after controlling for demographic background factors and acculturation, participation in leisure activities accounted for a significant portion of the variance in life satisfaction among Korean immigrant elderly persons.

- ❖ **Conn (1998)** studied that to develop and test the predictive ability of a model of exercise among older adults. The model's constructs related to exercise and self-efficacy included outcome expectancy, perceived barriers to exercise, perceived health, age, and lifelong leisure exercise among adults 65 to 100 years of age (N = 147). Data were collected by personal interview and analyzed with path analysis. The results of the study showed that Self-efficacy expectation had a strong direct effect on exercise. Outcome expectancy contributed little to exercise in the model, perceived barriers and self-efficacy expectation, followed by age, exerted the most total influence on exercise scores. Lifelong leisure

exercise exerts its influence on exercise through self-efficacy beliefs, further emphasizing the importance of efficacy. Also important are perceived barriers to exercise.

- ❖ **Jam et al. (1998)** studied Life satisfaction was assessed with the Satisfaction with Life Scale (SWLS) (Deiner, Emmons, Larsen, & Griffin, 1985). The subjects were given two trials to complete each item, with no prior practice, and the better of the two trials was recorded for analysis. There were no significant differences among the groups in age, height, weight, education level, and number of daily medications. Satisfaction with life scores were not significantly different, among individuals living in the community, assisted care facilities, or nursing facilities. A significant difference existed among the groups for self reported physical activity level. Physical activity level was lower in individuals living in nursing facilities as opposed to those living in the community or assisted care facilities. The differences among the groups are most likely due to multiple factors.
- ❖ **Colette (2000)** conducted a study on “The paradox of low academic achievement but high self esteem in African - American students: an attribution account” focuses on the expectancies, attributions and self-esteem of African-American college students. The existing literature with regard to attributions, expectancies and self-esteem is reviewed, and the findings from two recent studies are introduced. It is concluded that concerns over threats to self-esteem in African-American students may be misplaced. Instead the data show that African-American college students experience increasing doubts that their efforts will be rewarded in ways equivalent to those of white students and they make increasingly external attributions.
- ❖ **Dawson et al. (2004)** attempted to explore Mentoring of At-Risk Youth through In-School Recreation: Mentoring was an increasingly popular approach to dealing with the needs of at-risk youth. Mentors were generally older, more experienced people who served as good role models and offered positive encouragement to youth. Initial evaluations conducted with mentors showed that the program was successful in improving the self-esteem, social skills and academic performance of at-risk students. However, these evaluations faced a series of obstacles, and needed to be further developed and expanded. The study was conducted to

compare desired psychological benefits of leisure participation in American, Canadian, Japanese and Taiwanese college students via a sample of 449 respondents who were administered the Recreation Experience Preference (REP) scale. Interestingly, no differences were found between the students on the domains of nature appreciation, solitude/escape and family.

- ❖ **Rode (2004)** conducted the longitudinal test of an integrated model on job satisfaction and life satisfaction. The huge quantity of survey has relied on cross sectional data and their association was not explored by the earlier researches. But present study is based on model that explored the relation between work and satisfaction in life and a broad behaviour construct such as ‘core self evaluations’, non work satisfaction and environmental variables. The selected behaviour construct was found connected to both job and life satisfaction. After evaluated the effects of core self-appraisal and work dissatisfaction, the association between job contentment and life satisfaction was found not significant.
- ❖ **Comely (2004)** examined the effectiveness of one community healthy adult education programme targeting Hispanic older adults with arthritis, the Spanish Arthritis Self Management Education Programme (SASMEP), by evaluating changes in the participants general health, pain, disability, self efficacy, health perceptions, frequency of physical visits and exercise. A pre and post control group experimental design and analyses of covariance were used to determine the pre and post differences in health status and health behaviour for a group participating in the SASMEP and a group who did not using gender and age as covariates. Results indicated the participants decreased in arthritics disability immediately following the education. Self efficacy and health perceptions increased for both groups but not significantly. The participant's health behaviours showed significantly fewer physician visits and significant.
- ❖ **Jusoff et al. (2005)** conducted a study on the academic and non academic workers to judge their satisfaction in life. Some inconsistent things such as age and gender showed significant difference in their life satisfaction. The results suggested that the workers were moderately comfortable with their life. The demographic variables such as age, their experience and their life satisfaction

showed significant differences but the category of staff and gender found no significant difference in life satisfaction.

- ❖ **Jungare (2005)** conducted a survey on traditional sports and recreational activities of tribal cultural in Madhya Pradesh. Total subject 350 belonging to seven tribes were selected randomly as sample. The data were collected by using questionnaire interview scheduled. Analysis of the data was analysed by using percentage. The findings showed that traditional sports and recreational activities were more popular among the tribal culture included folk dance, folk songs and musical instruments played an important role in their social life and most of the sports activities were organized in groups by the tribal peoples and also accepted that their working efficiency is affected by the sports and recreational activities.
- ❖ **Kaur (2009)** studied professionalism in teachers in relation to emotional intelligence, locus of control and organizational climate. The study was evaluated on 400 college teachers of Chandigarh selected with the help of stratified random sampling technique. The study concluded that the significant association between professionalism and emotional intelligence, professionalism and organizational climate, professionalism and locus of control. The study also mentioned that male and female teachers vary significantly in professionalism, professional commitment and professional attitude. The examination also revealed that no difference was discovered in professional participation with respect to gender and in professionalism amid teachers with experience above and below 5 years; between government and private college teachers and also from professional and degree colleges.
- ❖ **Streimikiene and Grundey (2009)** analyzed the pressure of work on life satisfaction and happiness and also to explore the consequences of work relations, motivation and also the methods for selection of labour for happiness and life satisfaction of individuals. The quality of our life affected amazingly little by extra income as per the results of the study. The comprehensive conclusion of different research studies is well-being expected to be more powerfully influenced by personality aspects, personal relations and social involvement than by financial factors. The problems in behaviour, adjustment problems in married

life, problems at work place and self-assessed health are expected to influence ill-being is the harmful side of these factors.

- ❖ **Hyde et al. (2010)** assessed that Physical activity was a widely accessible and effective tool for improving well-being. This study aimed to unpack the feel-good effects of free-time physical activity. Multilevel models were applied to repeated measures of daily free-time physical activity and four types of feeling states obtained from 190 undergraduate students. People who were more physically active overall had higher pleasant-activated feelings than people who were less physically active, and on days when people were more physically active than was typical for them, they reported higher levels of pleasant-activated feelings. Both the between and within-person associations remained significant after controlling for day of week, sleep quality and carryover effects of previous day free-time physical activity and feeling states. Results suggested that both increases in overall levels and acute bouts of free-time physical activity were associated with increases in feelings of pleasant-activation.
- ❖ **McAuley and Rudolph (2010)** examined the effects of exercise and physical activity on the psychological well-being of older adults. Overall, the results of the 38 studies reviewed were overwhelmingly positive, with the majority reporting positive associations between physical activity and psychological well-being. This relationship appears to be moderated by the length of the exercise programs; longer programs consistently report more positive results. There was little evidence that exercise had differential psychological effects on men and women or on individuals of differing ages. Whereas training protocols seem to result in significant changes in physical fitness and well-being, such improvements appear to be unrelated.
- ❖ **Qahoush et al. (2010)** described Arab women's cardiovascular risk factors (CVD): physical activity levels, self-efficacy, and determinants of physical inactivity and their preferences for physical activity programs. This cross-sectional design used the International Physical Activity Questionnaire (IPAQ), Exercise Self-Efficacy Scale, Choose to Move Questionnaire and "How America Measures Up" Questionnaire. The mean age of the 180 women was 37.6 (± 12.9). A logistic regressions analysis found statistically significant

determinant(s) for physical inactivity performance were low self-efficacy score and "not being born in the U.S." These young Arab women are considerably physically inactive and overweight.

- ❖ **Klassen and Chiu (2011)** in their study explored the commitment to occupation and intention of quitting in working and non-working teachers. A cross sectional study pattern was used to check the effect of self-efficacy of teachers', Review of Related Literature anxiety in job and relative aspects on occupational commitment and teachers 'quitting objective. The number of 434 working teachers and 379 pre-service teachers were selected for the investigation. The occupational commitment and quitting intention of working and pre-service teachers was effected by factors such as teachers 'self-efficacy, stress in job and teaching framework. The higher levels of commitment was shown by pre-service teachers and less overall stress than working teachers.
- ❖ **Robert et al. (2011)** in their research examined the job and satisfaction in life of teachers. The sample of 235 teachers was selected for the social cognitive mould of work and life satisfaction of school teachers. The social cognitive model considered satisfied to the statistics, though not all individual path coefficients were significant. The results revealed that the three predictors such as positive work situations, efficacy-relevant supports and positive affectivity lead to job satisfaction of an individual. The remaining two predictors such as achievement of personal objectives and positive activities were leads to life satisfaction of teachers'. The satisfaction in work and also in life both are indirectly connected to self-efficacy.
- ❖ **Kaur (2013)** tried to compare professional commitment, self-efficacy and motivation of secondary school teachers and also explore the relationship of vocational pledge with self-efficacy, professional commitment with motivation and Review of Related Literature to calculate professional commitment on the basis of self-efficacy and motivation. Results found that Secondary school teachers have moderated professional commitment. Female teachers teaching in rural area schools had more occupational obligations as compared to men teachers teaching in urban areas and also no significant difference were noted on the basis of span of teaching experience. The results concluded that carefulness,

self-sufficiency, participation in decision-making, regular and helpful response and support from administrators and colleagues could enhance professional commitment and that teacher education was an imperative factor in preserving and strengthening commitment among teachers.

- ❖ **Telles et al. (2013)** conducted a study on the topic “Effect of yoga or physical exercise on physical, cognitive and emotional measures in children: a randomized controlled trial”. The present randomized controlled trial assessed the effects of yoga or physical exercise on physical fitness, cognitive performance, self-esteem and teacher-rated behavior and performance, in school children. Study reveal that social self-esteem which was higher after physical exercise compared to yoga ($p<0.05$). All the changes reported below are based on after-before comparisons, within each group. Both groups showed an increase in BMI and number of sit-ups ($p<0.001$). Balance worsened in the physical exercise group, while plate tapping improved in the yoga group ($p<0.001$). In the Stroop task both groups showed improved color, word- and color-word naming ($p<0.01$), while the physical exercise group showed higher interference scores. Total, general and parental self-esteem improved in the yoga group ($p<0.05$).
- ❖ **Solomon (2013)** conducted study to achieve the purpose 50 Corporate male employees were selected as subjects and divided in to two groups namely Experimental and Control group, each group consist of 25 male employees from the same organization with the age range was set between 24 and 30 years with 3 to 4 years of Corporate experience. Before the commencement of the minor games, the base level data (pre-test) was collected on Psychological and Organizational variables from the two groups, the Experimental and Control group. The result of the study shows, there is significant increase in Productivity, On - Time Delivery of Job, Quality of Work and In - Time Reporting among Corporate male employees participating in minor games them non – participating corporate male employees. There is significant decrease in Absenteeism among Corporate male employees participating in minor games than non - participating corporate male employees.
- ❖ **Bhunia (2014)** conducted a study to determine the influence of Yoga, traditional games & sports for global human resource development. In Yogic practices, there

is a harmonious development of all the muscles of the body, internal organs, nerves and frame. The experts name few Yogasana and Pranayam for physical and mental health and advice for Meditation. Beside this, Traditional games and sports are part of intangible heritage and a symbol of the cultural diversity of our societies. Generally Traditional Games and Sports are indigenous in nature. Experts say it is one of the excellent ways to remain healthy, fit, well being, and recreate. Through playing of these games human resource development is possible. However, Human resource development means improvement of working capacity.

- ❖ **Kim et al. (2017)** examined the effects of leisure-time physical activity (LTPA) involvement among older adults suffering from loneliness. Using data released from the Health and Retirement Study in 2008, this study investigated how participation in LTPA leads to well-being such as optimism, life satisfaction, psychological wellbeing, and positive affect among older adults with loneliness. Results indicated that the LTPA involvement was a significant predictor of optimism, life satisfaction, positive affect and psychological wellbeing for older adults with a high level of loneliness. The interesting findings of this study were that LTPA enhanced positive emotions for older adults with loneliness and that positive emotions are one of the important factors in protecting individuals from illnesses.
- ❖ **Tas and Iskender (2018)** in their study examined the Meaning of Life, contentment with Life, Self-Concept and Locus of Control amid Teachers. The goal of this study is to inspect meaning in life, satisfaction with life, self-concept and locus of control amid teachers by several variables. The research faction was made of 363 teachers (114 [40%] women, 219 [60%] men) employed in many districts of Istanbul. A positive connection was discovered amid realized meaning in life and contentment with life and self-concept while a negative connection was found between experienced meaning in life and locus of control. Anticipated meaning in life, contentment with life and locus of control were discovered to disagree by gender. It was also concluded that normal meaning in life and self-concept varied owing to marital status.

STUDIES ON NEUROPSYCHOLOGICAL VARIABLES

- ❖ **Wilhelm (1951)** undertook an extensive study to determine measurable traits related to success in football. At Indiana University, he tested 65 freshman football players and 65 freshman non football players. The measures that were taken were anthropometrical, strength, physiological and mental. The football players recorded superior scores in all strength and muscle girth measurements, in power, speed, agility, kinesthetic sense, depth perception and visual acuity. The non players were better in only one mental test.
- ❖ **Olsen (1960)** examined the relationship between psychological capacities and success in college Athletes to determine whether significant differences existed in Reaction time, Depth Perception and visual span of apprehension between three groups of college males, designated as varsity Athletes, intermediate Athletes and non-Athletes at Boston university were selected as subjects and also to determine the relationship if any of these three psychological capacities to selected sports skills in Basketball, Soccer, Hockey and Baseball. Three groups of 100 each were tested on simple, choice and discriminatory Reaction time; Depth Perception and Span of apprehension. Results revealed that both Athletes and the intermediate Athlete had better in simple Reaction time, choice Reaction time, Discriminatory Reaction time, Depth Perception and Span of apprehension score than the non-athletes.
- ❖ **William (1960)** examined psychomotor, space Perception and Anthropometrics measures of fencers and non-fencers. Twenty five fencers and an equal number of non-fencers were compared as to eight psychomotor measures and six anthropometrics measures. The subjects were measured under laboratory conditions. Results revealed that Fencers are significantly faster than non-fencers in those measures involve movement of the arm. Fencers and non-fencers do not differ in discriminatory or simple Reaction time and also there is no psychomotor measure determined by the subtractive method which would indicate an unknown discriminatory factor.
- ❖ **Smith and Harrison (1962)** conducted a study on comparison of the effect of visual motor, mental and guided practice upon speed and accuracy of performing

a simple eye-hand coordination task. Five groups significantly improved performance in terms of correct hits. From the results, it was concluded that visual practice and mental practice improved accuracy on a punch-board learning task.

- ❖ **Schwartz (1970)** placed thirty male college subjects in two groups to discover if varying degrees of general muscular fatigue had any effect on depth perception. The experimental group pedaled a bicycle ergo meter under conditions of increasing workloads until a heart rate of 170 bpm was reached, or until unable to pedal was required. The depth perception scores and heart rate were recorded simultaneously at pre-selected times during the experimental period. The study indicated no significant differences between the depth perception scores of the experimental and control group; no significant changes occurred in depth perception scores during the experimental period, and no significant interaction effect.
- ❖ **Hawkins and Barker (1978)** measured human performance on motor tasks and reaction time. For this purpose 45 healthy male subjects having an age range 18-26 years were selected. They were randomly assigned to three independent groups: One group was tested in 'natural' ion environment, 2nd in a predominantly 'negative ion (7×10^4 ions/cm³)' environment and 3rd in a predominantly 'positive ions (7.0×10^4 ion/cm³)' environment. Exposure of both the polarities was given for 2 hours. Results were analyzed by F-test showing significant increase in motor task whereas reaction time decreased with negative ions exposure. But no any negative effect of positive ions was found. So subjects performed best in the presence of negative air ions. But their Performance in the positive ionized air was the same as those in normal air.
- ❖ **Raman (1983)** conducted tests on 30 male Cricket players from graduate and undergraduate courses at Lakshmibai National College of Physical Education Gwalior in order to determine the relationship of grip strength, leg power, agility and hand and foot Reaction times to performance in Cricket. Data was collected on grip strength (grip dynamometer), leg power (standing broad jump). Agility (40 yard shuttle run) and hand and foot Reaction time (electronic Reaction timer) and performance were the average of subjective rating of three experts during

practice and match situations. Product moment correlation was employed to statistically treat the data. The researcher concluded that: 1) hand and foot Reaction time is the most important variable in the prediction of performance of a Cricketer. 2) Leg power is another important variable in the prediction of performance in Cricket, 3) Grip strength is also an important variable of prediction in Cricket playing ability and 4) agility is not an important factor in the prediction of performance in Cricket.

- ❖ **Brar (1984)** investigated the psycho physiological performance variations of high and low fitness groups resulting from induced mental and physical fatigues. Participants showed physical fatigue improved the reaction time whereas mental fatigue prolonged the reaction time, but fitness level and reaction time were independent. There were mental fatigue decreased the speed of movement whereas physical fatigue did not affect it and fitness and speed of movement where not related. The results also showed mental fatigue and physical fatigue impaired the hand steadiness of the subjects and also fitness was found to be an underlying factor of depth perception. Mental and physical fatigues impaired the depth perception.
- ❖ **Devi (1985)** made a study on 36-college level volleyball players to determine the relationship of depth perception, agility and the speed of movement. Her finding revealed that speed and agility along with movement contribute to volleyball playing ability. The result showed a significant relationship with speed of movement and agility.
- ❖ **Raviv and Nabel (1988)** undertook the study on field dependence/ independence and concentration as psychological characteristics of basketball players. Examined a possible connection between the visual perceptual cognitive ability of field dependence or independence and concentration, 2 variables relevant to performance of skills required in basketball. Subjects were 23–34 yrs old men of whom 21 were national level basketball players, 24 were lower-league basketball players, and 18 were nonathletic students. All were given the Group Embedded Figures Test and a test of concentration. The study revealed that a significant difference was found between the quality of concentration of national-level players. The difference was not substantial between the elite and amateur players

Low-to-medium correlations were found between field-dependence/independence and concentration among the groups.

- ❖ **Lipkova et al. (1997)** conducted study on relation between the motor and reaction abilities and the performance of young ice-hockey goalkeepers. Evaluated the reaction abilities of 7 male 6–17 yr old ice hockey players and studied the correlation between reaction abilities and complex performance of the goal-keeper in ice-hockey. Reaction abilities were evaluated using measures of simple reaction time, choice reaction time and agility. Performance was evaluated by each player's number of successful interventions and goal attempts (i.e., percentage of success fullness). Choice reaction time and simple reaction time were significantly related to the percentage of success fullness.
- ❖ **Argov and Daniel (1998)** conducted a study on “the exploratory study of perceptual motor abilities of women: novice and skilled players of team handball. They examined a variety of perceptual, e.g., anticipation time, reaction time and motor, e.g., throwing tasks, abilities of skilled and novice female team-handball players 13 First Division skilled and 10 recreational novice players (M age = 25.3 yr.) performed two laboratory activities for measurement of anticipation time, reaction time and movement time and three field tasks for measurement of accuracy and speed of throwing abilities in random order. Reaction time and movement time were collected during a unique team-handball motor activity. Analyses of variance with repeated measures on trial blocks indicated high mean proficiency for the skilled participants in reaction time and all field-throwing tests compared with the novice participants.
- ❖ **Collet (1999)** Strategic aspects of reaction time in world-class sprinters Investigated whether sprinters try to anticipate the starter's shot within the false start limit (100 m/sec). 8 male sprinters reaching the final heat of a sprint event in World Championships or Olympic Games were invited to participate in this study. Analysis indicated that RT to the starting shot plays a role in the finalists' strategy throughout an event. RT must be considered a skill dependent upon experience and learning and is associated with race length. The shorter the race, the more important the RT is for the final performance, so sprinters try to

decrease RT in the shorter dashes. In the longer sprint races they are content to respond to the shot. Intermediate distance races elicit intermediate values of RT.

- ❖ **Montes-Mico (2000)** investigated the eye-hand and eye-foot visual reaction time among young soccer players and to compare those with non-soccer players in order to evaluate possible differences. Result revealed that there are statistically significant differences between eye-hand and eye-foot reaction times between players and non-players ($p < 0.05$). There was no correlation between visual reaction times and age ($p < 0.05$). Whereas eye-hand and eye-foot visual reaction times were found to be different between the two populations evaluated. The results also showed differences between soccer and non-soccer players, with the soccer players demonstrating faster reaction times.
- ❖ **Shah et al. (2001)** conducted a study on Effect of Saral Meditation on Intelligence, Performance and Cardiopulmonary Functions. Effect of yoga on reaction time has been studied. However, the effects of meditation on psychomotor performance and pulmonary function have not been reported. Results show that the reaction time in response to visual (yellow, green and red) and auditory stimuli did not change significantly after meditation, however, maze, arithmetic ability showed considerable changes after regular practice of Saral meditation and there was significant improvement in intelligence (in relation to general knowledge). Performance III examination showed significant improvement after meditations. Meditation improved by against none prior to meditation. Cardiopulmonary functions - e.g. pulse, BP and PEFR also showed some changes after meditation, however, results were not statistically significant.
- ❖ **Crowe and O'Connor (2001)** studied the subjects with dark eye colour are thought to perform better on reactive tasks in comparison to light-eyed subjects, whereas light-eyed subjects show enhanced performance over dark-eyed subjects on self paced activities. This study examined reaction time unrestricted and peripheral vision and success at the self-paced activity of goal kicking in 59 elite male Rugby League players. Subject with dark eye colour did not react significantly faster than the light-eyed subject when tested unrestricted vision or peripheral vision. Examination of the self-paced activity of goal kicking showed

that the percentage success rate was not significantly higher in the light-eyed group than the dark eye-group.

- ❖ **Dane and Erzurumluoglu (2003)** examined the effects of gender, handedness, and eye dominance on visual reaction time in handball players. 270 right-handed and 56 left handed young handball players (mean age 15.81 yrs) were examined. Results show that all visual reaction times were longer in women than in men. In the eye-dominant hand and the left eye-left hand visual reaction times, the left handed had superiority over the right handlers, but there was no difference between the right eye-right hand visual reaction times of the right- and left handed. In right handed, all visual reaction times were longer in women than in men, but there was no sex difference in left handed.
- ❖ **Zisi et al. (2003)** investigated the relation between specific perceptual and motor abilities and the performance of this skill in his study of dynamic analysis of the ground reaction forces developed on the supporting foot during instep kicking. Forty five young soccer players (11-13 years of age) participated in a series of laboratory tests assessing simple, choice, and discrimination reaction time, sustained attention, depth perception, and sense of kinesthesia. Kicking performance measured by the amount of impulse (calculated as the integral of force) developed on the supporting foot during kicking. There was a significant correlation of the kicking impulse with choice reaction time ($r = -.54$) and attention reaction time ($r = -.41$). Stepwise regression analysis indicated that choice reaction time accounted for 29 percentage of the variation in the anterior/posterior kicking impulse and 16.4 percentage of the variation in the media/lateral kicking impulse. The significant relation between kicking impulse and measures concerning speed of information processing suggests that processes associated with fast response selection may play an important role in instep-kicking performance.
- ❖ **Ward and Williams (2003)** examined the relative contribution of visual, perceptual, and cognitive skills to the development of expertise in soccer. 137 elite and sub-elite players (aged 9-17 yrs) were assessed using a multidimensional battery of tests. Four aspects of visual function were measured: static and dynamic visual acuity; stereoscopic depth sensitivity and peripheral awareness.

Perceptual and cognitive skills were assessed via the use of situational probabilities, as well as tests of anticipation and memory recall. Stepwise discriminate analyses revealed that the tests of visual function did not consistently discriminate between skill groups at any age. Tests of anticipatory performance and use of situational probabilities were the best in discriminating across skill groups. Memory recall of structured patterns of play was most predictive of age. As early as age 9, elite soccer players demonstrated superior perceptual and cognitive skills when compared to their sub-elite counterparts.

- ❖ **Edermann et al. (2004)** examined the influence of cup stacking on hand-eye coordination and reaction time of 24 boys and 18 girls in second grade as measured by the Soda Pop and Yardstick tests, respectively. Two physical education classes were randomly assigned as treatment and control groups and were pre- and post-tested for hand-eye coordination and reaction time. The treatment group participated in a 5-week cup-stacking program. Significant improvements were noted for both hand eye coordination and reaction time between the pre- and post-test scores for this group but not for the control group.
- ❖ **Lemmink and Visscher (2005)** studied the effect of Intermittent Exercise on Multiple choice Reaction Times of Soccer Players. The influence of intermittent exercise on a choice-response time task was investigated. Two groups of 8 male soccer players (M age = 20.9, SD = 2.0) participated. Analysis showed that reaction speed and response accuracy were not significantly different between the two groups. Furthermore, there were significant faster reaction times and a larger number of correct reactions through Block 2 in both the exercise and control group ($p < .05$), probably a result of learning processes and familiarization with the task procedures.
- ❖ **Rege and Joshi (2005)** conducted a study to determine the effects of remedial therapy on visual perception, depth perception and balance in a community dwelling elderly population. The tests used included Test of Visual Perceptual Skills (TVPS), a depth perception instrument and the Timed up and Go test (TUG). The participants were tested on these before and after the remedial programme. The remedial program used in this study did show a qualitative and quantitative improvement in almost all the components of the factors tested in the

study. Thus, a simple remedial program used by a therapist working with an older population can help to improve their quality of life.

- ❖ **Singh (2005)** investigated the area of information processing assessment of Handball players, in the laboratory conditions. A sample of 131 players was taken from the national Handball players, attending training camp at SAI NS NIS, Patiala. The results, in general, revealed the superiority of Jr. Male and female players, over their senior male and female counter parts, in the variables of auditory reaction time. However in visual perceptual accuracy, the senior male players were found to be scoring better, when compared to junior players.
- ❖ **Du Toit et al. (2007)** examined the effect of physical exercise on hand-eye co-ordination and visual reaction time. The purpose of this study was to determine whether exercise can improve an athlete's visual performance in order to achieve maximal results on the sports ground. Thirty rugby players, aged 16 to 18, were chosen as subjects. To evaluate the effect of physical exercise on hand-eye co-ordination, a pre-test post-test control group design was adopted for the study. The pre- and post- exercise values of the subjects in the control and experimental group were pooled to determine the averages and differences. The results showed that there was an enhancement in the performances of subjects that were exposed to the physical exercises.
- ❖ **Pei et al. (2007)** conducted a study was to evaluate the effect of motor control from Tai Chi Chuan (TCC) on eye-hand coordination in the elderly. Forty-two elderly people were recruited into this study. People in the TCC group ($n = 22$) had been practicing TCC regularly for more than 3 years. The control group ($n = 20$) comprised healthy and active elderly people. Results showed that The TCC group showed significantly better results in decrease of displacement ($p = 0.003$), movement time ($p = 0.002$), pause time ($p < 0.001$), number of sub movements ($p = 0.001$) and better skewness coefficients ($p < 0.001$) than the control group. However, the difference in the peak velocity of the TCC and control groups did not reach statistical significance ($p = 0.026$). The elderly TCC group had better results on the eye-hand coordination test than the control elderly group.

- ❖ **Woo et al. (2007)** examined the effects of Tai Chi (TC) and resistance exercise (RTE) on bone mineral density (BMD), muscle strength, balance and flexibility in community living elderly people. Onehundred eighty subjects (90 men, 90 women) aged 45–54, were recruited through advertisements in community centers. Subjects were assigned to participate in TC, RTE three times a week or no intervention (C) for 12 months. Results revealed that compliance was high (TC 81%, RTE 76%). In women, both TC and RTE groups had less BMD loss at total hip compared with controls. No effect was observed in men. No difference in balance, flexibility or the number of falls was observed between either intervention or controls after 12 months.
- ❖ **Dane et al. (2008)**, conducted study on the relations of simple reaction times of right and left hands with muscle powers of right and left hands, back, and leg were examined. Hand preference was assessed by the modified Edinburgh Handedness Inventory. Measurements for reaction time were taken using the New test 2000 Reaction Time Apparatus. Takei Kiki Kogyo Dynamometers were used in measuring the muscle power of the subjects (0-100 kg). The simple reaction time (SRT) for right hand was not correlated with right and left hand and leg. The left hand SRT was significantly negatively correlated with right and left hand and leg powers. The choice RT was significantly correlated with right and left hand powers, but not leg power. There were no right-left differences in simple RT and hand power. These results suggest that sport activities are associated with eye-hand visual reaction time (VRT) and visuo spatial intelligence (VST). Exercise's positive effect may be associated with especially the right brain or left hand.
- ❖ **Singh et al. (2009)** assesses the effects of selected meditative asanas on kinesthetic perception and movement speed. Thirty randomly selected male students aged 18 – 24 years volunteered to participate in the study. They were randomly assigned into two groups: A (meditative) and B (control). The Nelson's movement speed and reaction test and horizontal space test (to assess the kinesthetic ability to determine specific positions along the horizontal line) were applied. The subjects from Group A were subjected to 8-week training of meditative asanas which included Padmasana, Siddhasana, Sukhasana, Vajrasana and Ushtrasana. Results: The kinesthetic perception and movement speed

significantly ($p < 0.001$) improved (by nearly 10%) in Group A compared with the control one.

- ❖ **Akarsu et al. (2009)** compared sports-related visual abilities such as hand-eye reaction time and visuospatial intelligence of athletes to non athletes. Differences in sports-related visual abilities such as hand-eye reaction time and visuospatial intelligence between athletes and non athletes were studied in 157 male (M age = 13.9 years, SD = 1.8) and 126 female (M age = 13.9 years, SD = 1.7) high school students. Visuospatial intelligence was assessed with Cattell's Culture Fair Intelligence Test. A software package of random stimulus presentation and response recording was used for eye-hand reaction time. It was to be concluded that athletes had lower eye-hand visual reaction time (the faster) ($P < .001$) and higher visuospatial intelligence ($P < 0.01$) compared to non athletes. There were no sex differences. There was a negative correlation between the number of years of doing sports and eye-hand visual reaction time ($r = 0.3$, $P < 0.001$) and a positive correlation with visuospatial intelligence ($r = 0.3$, $P < 0.001$).
- ❖ **Hsu et al. (2010)** evaluated the effects of swimming on upper extremity motor control and balance in elderly population. The swimming group consisted of 20 swimmers (n_{20} , 65.4 ± 5.5 years) who received regular swimming exercise for more than 2 years. The control group consisted of 34 healthy active subjects (n_{34} , 67.4 ± 5.7 years) who have regular exercises other than swimming. The eye hand coordination was evaluated by calculating the mean reaction time required in accurately pointing onto the centre of the target sensors that come in three different sizes (1 cm, 1.5 cm, and 2 cm in diameter). The SMART Balance Master device was used to measure posture balance. The maximal stability, centre of pressure (COP) velocity and percentage ankle strategy were obtained under six different balance conditions. In the testing of upper extremity motor control, the swimming group had significant shorter mean reaction time as compared with the control group in all three target sensor sizes ($p < 0.05$). In balance testing, the swimming group had significant greater percentage of ankle strategy during eyes closed and fixed support (EC), and sway-referenced vision and support (SVSS) conditions as compared with the control group ($p < 0.05$).

- ❖ **Seidler et al. (2010)** performed a study to investigate the review was to summarize the subset of this literature that has addressed age-related changes in the neural control of movement. They broadly review age-related brain differences and motor deficits in older adults in addition to cognition-action theories. Age-related atrophy of the motor cortical regions and corpus callosum may precipitate or coincide with motor declines such as balance and gait deficits, coordination deficits, and movement slowing. Correspondingly, degeneration of neurotransmitter systems-primarily the dopaminergic system-may contribute to age-related gross and fine motor declines, as well as to higher cognitive deficits. In general, older adults exhibit involvement of more widespread brain regions for motor control than young adults, particularly the prefrontal cortex and basal ganglia networks. Unfortunately these same regions are the most vulnerable to age-related effects, resulting in an imbalance of “supply and demand”. Existing exercise, pharmaceutical, and motor training interventions may ameliorate motor deficits in older adults.

- ❖ **Drid et al. (2010)** investigated the effects of intense physical activity on visual skills in elite female judokas. The sample consisted of 18 female judokas, who were all members of the Serbian national team. They were divided into two groups according to their international ranking and/or results, Group A: more successful, Group B: less successful. Both groups scored similarly in visual perception skills on the Landolt test at the starting point. Results obtained indicate that the visual perception apparatus resources were activated at a 60% workload. The further increase of exercise workloads however, caused progressive exhaustion of these resources in both groups. On the other hand, the within-group changes in the landolt test, occurring as a result of increased workloads were statistically significant for both groups ($p=.01$). Results also showed that intense exercise affects visual perception accuracy.

- ❖ **Toit et al. (2010)** examined the effect exercise in the visual skill performance. Twenty six (26) rugby players aged 18 to 26 were subjected to three different sports vision tests. The players were exposed to a period of isolated exercises for physical exertion intervention between the pre- and post sports vision tests. From the results, an improvement in performance was observed by players exposed to

these exercises. A significant improvement ($p < 0.05$) was observed in the number of successful catches and simultaneous ball throw, while a non significant improvement was seen in the number of successful throws through a ring (accurate passing).

- ❖ **Paul et al. (2011)** described the role of sports vision and eye hand co-ordination training in performance of table tennis players. 45 University level table tennis players were randomly divided into 3 equal groups of $n=15$. The experimental group underwent 8 weeks of sports vision and eye hand co-ordination training. The placebo group read articles pertaining to sports performance and watched televised table tennis matches, while the control group followed only routine practice sessions for 8 weeks. Measures of visual function and motor performance were obtained from all participants before and immediately after 8 weeks of training. Statistically significant pre to post training differences were evident by better improvement in visual variables and motor performance for the experimental group as compared to placebo and control.
- ❖ **Srinivasan (2011)** investigated the effectiveness of Mental Rehearsal on Hand Eye Co-ordination. A total of 50 international students participated in this study. All the participants were randomly assigned into a control group ($n=25$) who traced the maze with no mental rehearsal before the task and experiment group ($n= 25$) who performed mental rehearsal before starting the task. Results indicated that three-way interactions for both distance, $F(1, 46) = .10$, $p = .76$, and touch, $F(1, 46) = 0.09$, $p = .77$, were non significant. All two-way interactions for both variables were also non significant. For distance, main effects for both trial and group were non significant ($p > .025$); however, the main effect for gender was significant, $F(1, 46) = 10.86$, $p = .002$. For touch, main effects for both trial $F(1, 46) = 36.17$, $p < .01$ and group $F(1, 46) = 3.34$, $p = .28$ were significant. The significant effects observed on the touches variable suggest that mental rehearsal does improve hand eye co-ordination, as the experimental group demonstrated significantly better performance on hand eye co-ordination task than the control group. This implies that mental rehearsal combined with physical practice has greater effect than only physical practice. There was a significant gender differences in performance of both touch and

distance variables. Females did better in both touch and distance variable when compared to male counterparts.

- ❖ **Ceccato et al. (2011)** analyzed the effect of a single session of resistance training on skin sensitivity in physically active, hypertensive and normotensive older women, as well as compare skin sensitivity in both groups. Thirty-two physically active women (mean age 65.8 $\pm$ 5.1 years; weight, 69.5 $\pm$ 13.7 kg; height, 1.60 $\pm$ 0.1 m) participated in this study and were classified as hypertensive (n = 15) or normotensive (n = 17). Before and after the resistance training session, the skin sensitivity of the dominant hand was assessed at seven anatomical sites on the dorsal and palmar surfaces by stimulation with a Semmes-Weinstein monofilament aesthesiometer. The Wilcoxon test showed no statistically significant differences in the skin sensitivity test before and after resistance training in either group. However, the Mann-Whitney U revealed a statistically significant between-group difference in sensitivity at three sites before resistance training and at only one site post training. However, hypertensive participants exhibited reduced skin sensitivity at some anatomical sites as compared with normotensive women.
- ❖ **Du Toit et al. (2012)** studied to examine the changes in various visual skills during a 20-week military basic training programme. The participants (n=234) consisted of both male and female recruits who were enrolled for basic training at the South African National Defense Force (SANDF). The data collection occurred before the onset of the basic training programme and again after 12 and 20 weeks of intensive training. This schedule was proposed in order to ensure the specific requirements demanded by the various tests, and to observe the rate at which the visual skills and physiological parameters changed. The improvement of various visual skills observed in this research provides evidence that physical exercise, along with an enhanced state of physical fitness, does have a positive effect on visual proficiency.
- ❖ **McKeen (2013)** performed a cross-sectional study to investigate, an intervention involving motor skills training, whole body exercise, sports and games was used to improve balance, fine and gross motor manual control and reaction time in a group of adults with autism and ID. Fine motor skill was measured using the 25

Grooved Pegboard Test, gross motor skill of the upper extremities was measured with the Box and Blocks Test, and reaction time was measured with the Stick Catching Test. Results revealed that significant fine motor improvement occurred at retention when compared to baseline and gross motor improvement approached statistical significance but only when the sums of both trials at each session were taken. Statistically significant improvements were not found for reaction time testing or for any static balance variables.

- ❖ **Crepeau et al. (2016)** studied to examine the effects of combined physical and cognitive interventions on physical fitness and neuropsychological performance in healthy older adults. Seventy-six participants were randomly assigned to one of four training combinations using a 2×2 factorial design. Results showed that all groups equivalent improvements in measures of functional mobility. All groups showed improved speed of processing and inhibition abilities. The level of functional mobility after intervention was significantly associated with task-switching abilities. Combined training did not yield synergetic effects. However, DT training did lead to transfer effects on executive performance in neuropsychological tests. Both aerobic-resistance training and stretching-toning exercises can improve functional mobility in older adults.

STUDIES ON PHYSIOLOGICAL VARIABLES

- ❖ **Shelton (1986)** investigated social and physiological factor that influence women's participation in recreational physical activity. Using a participation questionnaire designed for the study, data were collected from 202 women randomly selected from a Houston suburb. Hypothesis one was participation in physical activity is a function of the competing commitments of work, education, home and childcare, plus the physiologically variable of health status, age and body mass, and encouragement for participation, intrinsic and extrinsic rewards and satisfactions and beliefs about the compatibility of activity with one's sex role. The major conclusion was the women's participation in physical activity was a function of compelling commitments, physiological factors and social factors, specific variables related to participation included intrinsic satisfactions, body mass index and home and child care obligations.

- ❖ **Kelley (1997)** examined the study with the use of the meta-analytic approach, was to examine the effects of dynamic resistance exercise, i.e., weight training, on resting systolic and diastolic blood pressure in adults. A total of nine studies consisting of 259 subjects (144 exercise, 115 control) and 18 groups (9 exercise, 9 control) were included in this analysis. With the use of the bootstrap technique (10,000 samples), significant treatment effect (D3) reductions were found across all designs and categories for both systolic and diastolic blood pressure [systolic, mean 6 SD 5 24.55 6 1.75 mm Hg, 95% confidence interval (CI) 5 21.56 to 28.56; diastolic, mean 6 SD 5 23.79 1 1.12 mm Hg, 95% confidence interval CI 5 21.89 to 26.33]. D3 changes corresponded with relative decreases of 3 and 4% in resting systolic and diastolic blood pressure, respectively. In conclusion, meta-analytic review of included studies suggests that dynamic resistance exercise reduces resting systolic and diastolic blood pressure in adults. However, it is premature to form strong conclusions regarding the effects of dynamic resistance exercise on resting blood pressure. A need exists for additional, well-designed studies on this topic before a recommendation can be made regarding the efficacy of dynamic resistance exercise as a non pharmacological therapy for reducing resting blood pressure in adults, especially in hypertensive adults.

- ❖ **Hu et al. (1999)** examined the relationship of total physical activity and incidence of type 2 diabetes in women and compared the benefits of walking vs. vigorous activity as predictors of subsequent risk of type 2 diabetes. The Nurses' Health Study, a prospective cohort study that included detailed data for physical activity from women surveyed in 11 US states in 1986, with updates in 1988 and 1992. A total of 70,102 female nurses aged 40 to 65 years who did not have diabetes, cardiovascular disease, or cancer at baseline (1986) were participants for this study. Risk of type 2 diabetes by quintile of metabolic equivalent task (MET) score, based on time spent per week on each of 8 common physical activities, including walking was the variable considered for this study. During 8 years of follow-up (534, 928 person years), authors documented 1419 incident cases of type 2 diabetes. Among women who did not perform vigorous activity, multivariate RRs of type 2 diabetes across quintiles of MET score for walking were 1.0, 0.91, 0.73, 0.69, and 0.58 (P for trend <.001). After adjusting for BMI, the trend remained statistically significant (RRs were 1.0, 0.95, 0.80, 0.81, 0.74; P

for trend = .01). Faster usual walking pace was independently associated with decreased risk. Equivalent energy expenditures from walking and vigorous activity resulted in comparable magnitudes of risk reduction.

- ❖ **Ken et al. (1999)** investigated the training effects of daily jogging and nutritional control on treatment of obesity in middle-aged and older women, physical training for six months was prescribed. Training group members were 11 obese housewives aged (45-34). As a result of instruction about nutrition and physical training for six months, the subjects' body weight and Rohrer's index markedly decreased. In addition to that, some items of blood contents and aerobic function improved and symptoms of hyperlipidemia decreased. In conclusion, it was considered that nutritional control as well as physical training would be indispensable as a prescription for middle-aged and older obese people.
- ❖ **Kelley and Kelley (2000)** conducted a study to use the meta-analytic approach to examine the effects of progressive resistance exercise on resting systolic and diastolic blood pressure in adult humans. Studies were retrieved via (1) computerized literature searches, (2) cross-referencing from original and review articles, and (3) review of the reference list by 2 experts on exercise and blood pressure. Inclusion criteria were as follows: (1) trials that included a randomized non exercise control group; (2) progressive resistance exercise as the only intervention; (3) adult humans; (4) journal articles, dissertations, and masters theses published in the English-language literature; (5) studies published and indexed between January 1966 and December 1998; (6) resting systolic and/or diastolic blood pressure assessed; and (7) training studies lasting a minimum of 4 weeks. The findings imply that across all designs and categories, fixed-effects modeling yielded decreases of 2% and 4% for resting systolic and diastolic blood pressure, respectively (mean±SD systolic, 126.3 mm Hg; 95% bootstrap CI, 24 to 21 mm Hg; mean±SD diastolic, 86.2 mm Hg; 95% bootstrap CI, 24 to 21 mm Hg). It was concluded that progressive resistance exercise is efficacious for reducing resting systolic and diastolic blood pressure in adults.
- ❖ **James et al. (2003)** conducted a study to determine the long-term endurance training significantly influences how the autonomic nervous system controls heart function. Endurance training increases parasympathetic activity and decreases

sympathetic activity in the human heart at rest. These two training-induced autonomic effects, coupled with a possible reduction in intrinsic heart rate, decrease resting heart rate. Long-term endurance training also decreases sub maximal exercise heart rate by reducing sympathetic activity to the heart. Physiological ageing is associated with a reduction in parasympathetic control of the heart; this decline in parasympathetic activity can be reduced by regular endurance exercise. Some research has indicated that females have increased parasympathetic and decreased sympathetic control of heart rate. These gender-specific autonomic differences probably contribute to a decreased cardiovascular risk and increased longevity observed in females.

- ❖ **Rennie et al. (2003)** examined the cross-sectional study to determine the extent to which moderate and vigorous physical activity were associated with higher HRV in a large population-based study and whether any associations observed differed with body weight. All nonindustrial civil servants aged 35–55 years working in the London, United Kingdom, offices of 20 departments were invited to participate in this study. Five minute recordings of heart rate and HRV measures were obtained from 3,328 participants. Calculated were time domain (standard deviation of NN intervals) and high-frequency-power measures as indicators of cardiac parasympathetic activity and low-frequency power of parasympathetic-sympathetic balance. Leisure-time physical activity (metabolic equivalent-hours per week) was categorized as moderate (≥ 3 – <5) and vigorous (≥ 5). Moderate and vigorous physical activity was associated with higher HRV and lower heart rate. This study has shown associations between moderate and vigorous activity and HRV. Increased HRV may be an important mechanism by which physical activity reduces the risk of coronary heart disease, which may operate independently or in concert with effects on other risk factors.
- ❖ **Slentz et al. (2004)** determined the effects of different amounts and intensities of exercise training. Sedentary, overweight men and women (aged 40–65 years) with mild to moderate dyslipidemia were recruited from Durham, NC, and surrounding communities. Eight-month exercise program with 3 groups. Results of the study revealed that there was a significant ($P < .05$) dose-response relationship between amount of exercise and amount of weight loss and fat mass

loss. The high-amount/vigorous-intensity group lost significantly more body mass and fat mass than the low-amount/moderate-intensity group. Both low-amount groups had significantly greater improvements than controls but were not different from each other.

- ❖ **Kerry et al. (2005)** conducted a 6-month randomized controlled trial of combined aerobic and resistance training; controls followed usual care physical activity and diet advice. Participants (aged 55-75 years) had untreated systolic BP (SBP) of 130 to 159 mm Hg or diastolic BP (DBP) of 85 to 99 mm Hg. Results indicated that A 6-month program of aerobic and resistance training lowered DBP but not SBP in older adults with mild hypertension more than in controls.
- ❖ **Sato et al. (2006)** determined the physical fitness component that contributes to improving and maintaining health status for each age group as well as quantifying the degree of the relationship between health status and physical fitness in middle-aged and elderly males. The participants were 995 males aged 30 to 69 years. Ten physical fitness tests and medical checkups were performed. The participants were divided into a healthy group and an unhealthy group according to health status. The results showed that there is a relatively high relationship between the health status and physical fitness level for middle-aged and elderly males.
- ❖ **Fransson et al. (2006)** conducted study to evaluate whether leisure-time physical activity compensates for the increased risk of acute myocardial infarction associated with overweight and obesity. The purpose of the study was Data from the SHEEP (Stockholm Heart Epidemiology Program) study were used. The result shows that there was Regular leisure-time physical activity was associated with a decreased risk of myocardial infarction among lean, normal-weight and overweight subjects, but not among obese subjects. Further results shows it was concluded While regular leisure-time physical activity seems to provide protection against myocardial infarction among lean, normal-weight and overweight subjects, this does not appear to be the case in obese subjects.
- ❖ **Lachman and Agrigoroaei (2010)** conducted a national longitudinal study, Midlife in the United States (MIDUS), with assessments in 1995–1996 and 2004–

2006, and 3,626 community-residing adults, aged 32 to 84, were included in the analyses. Functional health (Physical Functioning sub scale of the SF-36) and protective factors were measured at both occasions. While controlling for socio-demographic, health status, and physical risk factors (large waist circumference, smoking, and alcohol or drug problems), a composite of the three protective variables (control beliefs, social support, and physical exercise). Results revealed that Age-related declines in health were reduced among those with more protective factors up to a decade earlier in life. Modifiable psychological, social, and physical protective factors, individually and in the aggregate, are associated with maintenance of functional health, beyond the damaging effects of physical risk factors.

- ❖ **Pradeep et al. (2012)** conducted study on “Impact of Selected Minor Games on Physiological Factors and Relationship between Obesity; Among School Students”. To achieve the purpose of study 230 School Students were selected from the subjects and impact of minor games group was 230 participants, (Age 10 to 17 years). The following Body Mass Index (BMI), BMI percentile, percent body fat, waist circumference and heart rate variables were tested through standard test. The pre test were conduct before the experimental training. The experimental training were given to the experimental groups for the period of eight weeks, Analysis of covariance (ANOVA) were used. The result of the study shows that there was minor game programme resulted in reducing overweight and obesity rates in kerala school children.
- ❖ **Ajeesh et al. (2013)** conducted a study to analyze the Impact of selected minor games on physiological factors and relationship between obesity; among school students. The effectiveness of the selected minor games programme on the physiological factors of 230 obese school children (126 girls and 104 boys; aged 10-17 years) in Kerala, India, was evaluated. The results showed that BMI decreased significantly. There was also a significant decrease in BMI percentile. The mean percent body fat decreased, the mean waist circumference decreased significantly and the mean heart rate decreased.
- ❖ **Militao et al. (2013)** conducted study to investigate recreational physical activity and a health-habit orientation program using an illustrated diary on the

cardiovascular risk profile of overweight and obese children. 314 school children aged between 9 and 11 years old, in a public school in Brasilia, Federal District, Brazil, were recorded. According to the body mass index (BMI) classification proposed by the World Health Organization, 84 were overweight or obese for their age and sex. The CG did not show any change in the health parameters assessed. The result of the study shows that there was the program was 50 effective in reducing risk factors for cardiovascular disease and the use of an illustrative diary may have been the key to this result, since students were motivated to change their poor eating habits and to increase their physical activity level.

- ❖ **Cornelissen et al. (2013)** performed a systematic review and meta-analysis was to determine the effect of aerobic endurance training on daytime and night-time BP in healthy adults. A systematic literature search was conducted using Pub Med and Cochrane Controlled Clinical trial registry from their inception to May 2012. Randomized controlled trials of at least 4 weeks investigating the effects of aerobic endurance training on ambulatory BP in healthy adults were included. Inverse weighted random effects models were used for analyses, with data reported as weighted means and 95% confidence limits. Included the 15 randomized controlled trials, involving 17 study groups and 633 participants (394 exercise participants and 239 control participants). Overall, endurance training induced a significant reduction in daytime SBP [3.2 mmHg, 95% confidence interval (CI), 5.0 to 1.3] and daytime DBP (2.7 mmHg, 95% CI, 3.9 to 1.5).
- ❖ **Soares-Miranda et al. (2014)** evaluated serial longitudinal measures of both physical activity and 24-hour Holter HRV over 5 years among 985 older US adults in the community-based Cardiovascular Health Study. After multi variable adjustment, greater total leisure-time activity, walking distance, and walking pace were each prospectively associated with specific, more favorable HRV indices, including higher 24-hour standard deviation of all normal-to-normal intervals ($P_{trend}=0.009$, 0.02, 0.06, respectively) and ultra low-frequency power ($P_{trend}=0.02$, 0.008, 0.16, respectively). Greater walking pace was also associated with a higher short-term fractal scaling exponent ($P_{trend}=0.003$) and lower Poincaré ratio ($P_{trend}=0.02$), markers of less erratic sinus patterns. Greater

total leisure-time activity and walking alone, as well, were prospectively associated with more favorable and specific indices of autonomic function in older adults, including several suggestive of more normal circadian fluctuations and less erratic sinoatrial firing.

- ❖ **Flotum et al. (2016)** studied to evaluate a nationwide exercise intervention with Football Fitness in a small-scale society. In all, 741 adult participants (20–72 yrs) were successfully recruited for Football Fitness training in local football clubs, corresponding to 2.1% of the adult population. A pre intervention test battery including resting heart rate (RHR), blood pressure, and body mass measurements along with performance tests (Yo-Yo Intermittent Endurance level 1 (Yo-Yo IE1), the Arrowhead Agility Test and the Flamingo Balance Test) were performed. Results indicated after 18 wks mean arterial pressure (MAP) was -2.7 ± 0.7 mmHg lower with even greater reductions for those with baseline MAP values >99 mmHg (-5.6 ± 1.5 mmHg;). RHR was lowered by 6 bpm after intervention (77 ± 1 to 71 ± 1 bpm). Yo-Yo IE1 performance increased by 41% (540 ± 27 to 752 ± 45 m), while agility and postural balance were improved by ~ 6 and $\sim 45\%$, respectively. Football Fitness was shown to be a successful health-promoting nationwide training intervention for adult participants with an extraordinary recruitment, a high attendance rate, moderate adherence, high exercise intensity, and marked benefits in cardiovascular health profile and fitness.
- ❖ **Vrachimis et al. (2016)** conducted a study to examine the effect of circuit training (CT) on resting heart rate variability (HRV) and other cardiovascular disease (CVD) risk factors such as blood lipids and blood glucose and on fitness components. Twenty-four healthy untrained adults (age 26.5 ± 5.1 years; height 1.67 ± 8.4 m; weight 66.8 ± 15.1 kg; $26.3\% \pm 5.2\%$; maximum oxygen uptake (VO₂max) 48.5 ± 10.0 ml·kg⁻¹·min⁻¹) were assigned to either CT (n = 12) involving body weight exercises, or control (CON, n = 12) groups. Prior to the start and following the end of the six-week training period, time-, frequency-domain and nonlinear measures of resting HRV, arterial blood pressure, body composition, fasting blood lipids, lipoproteins and glucose, VO₂max, upper body muscular endurance (UBME) and abdominal and hip flexor (AHFME), back strength (BS) and handgrip were assessed. Results indicated none of the resting

HRV measures ($P > 0.05$) were affected by the CT intervention. However, diastolic blood pressure decreased ($P = 0.03$), lean body weight ($P = 0.03$) increased, $VO_{2\max}$ ($P = 0.03$), UBME ($P < 0.001$), AHFME ($P = 0.04$), and BS ($P = 0.03$) were significantly higher following CT, whereas the other variables were not influenced by the CT. Six-week of CT involving body weight exercises has no significant impact on resting HRV.

- ❖ **Luo et al. (2017)** investigated a systematic review to examine the health benefits of recreational soccer in middle-aged and older adults. Five trials described in 13 articles were included, which scored 6–9 out of 12 points on the modified Delphi quality rating scale. The duration was from 12 to 52 weeks, with various frequencies, volumes and game formats performed both outdoors and indoors with men and women. The trials indicate that recreational soccer may result in improvement in cardiovascular function, body composition and functional ability, although no significant changes were observed in postural balance. Recreational soccer should be considered an alternative exercise modality for untrained, healthy or unhealthy middle-aged and older adults of both sexes to maintain an active lifestyle and mitigate a wide array of physical and physiological age-related changes.
- ❖ **Krustrup et al. (2017)** investigated a systematic review describes the fitness and health effects of recreational football in women aged 18–65 years. The review documents that 2×1 h of recreational football training for 12–16 weeks causes marked improvements in maximal oxygen uptake (5–15%) and myocardial function in women. Moreover, mean arterial blood pressure was shown to decrease by 2–5 mmHg in normotensive women and 6–8 mmHg in hypertensive women. This review also show that short-term (< 4 months) and medium-term (4–16 months) recreational football training has major beneficial impact on metabolic health profile in women, with fat losses of 1–3 kg and improvements in blood lipid profile. Lastly, 2×1 h per week of recreational football training for women elevates lower extremity bone mineralisation by 1–5% and whole-body bone mineralization by 1–2% within 4–12- month interventions. These training adaptations are related to the high heart rates, high number of fast runs, and multiple changes of direction and speed occurring during recreational football

training for untrained women. In conclusion, regular small-sided football training for women is an intense and versatile type of training that combines elements of high-intensity interval training (HIIT), endurance training and strength training, thereby providing optimal stimuli for cardiovascular, metabolic and musculoskeletal fitness.

- ❖ **Moriah et al. (2018)** investigated a systematic review to estimate the pooled effects of community-based, recreational-level group sports on cardiometabolic risk factors and fitness parameters among adults. The systematically searched electronic databases for English articles reporting the effectiveness of recreational-level group sports, published between January 1, 1965 and January 17, 2017. The extracted baseline and end of intervention means for cardiometabolic and fitness parameters. Random- or fixed-effects meta-analyses were used to obtain pooled pre/post change in outcome means within intervention participants and between groups. From 2,491 screened titles, 23 publications were included (N=902, age [mean $\pm$ SD] 46.6 $\pm$ 11.7 yrs), comprised of 21 soccer and two rugby interventions. Intervention participants achieved larger improvements compared to control subjects in weight, BMI, waist circumference, body fat, total cholesterol, LDL cholesterol, systolic blood pressure, diastolic BP, VO2 max and RHR. Most studies (n=16) were classified as high-quality, and found no evidence of publication bias. The systematic review found significant cardiometabolic and fitness improvements following group sport participation, primarily recreational soccer.
- ❖ **Reimers et al. (2018)** conducted a systematic review was to assess whether regular exercise or sports have an impact on the RHR in healthy subjects by taking different types of sports into account. A systematic literature research was conducted in six databases for the identification of controlled trials dealing with the effects of exercise or sports on the RHR in healthy subjects was performed. The studies were summarized by meta-analyses. The literature search analyzed 191 studies presenting 215 samples fitting the eligibility criteria. 121 trials examined the effects of endurance training, 43 strength training, 15 combined endurance and strength training, 5 additional school sport programs. 21 yoga, 5 tai chi, 3 qigong, and 2 unspecified types of sports. All types of sports decreased

the RHR. However, only endurance training and yoga significantly decreased the RHR in both sexes. The exercise-induced decreases of RHR were positively related with the pre-interventional RHR and negatively with the average age of the participants. From this, we can conclude that exercise—especially endurance training and yoga—decreases RHR.

- ❖ **Trajkovic et al. (2020)** conducted a Study to investigate whether recreational volleyball organized as small-sided games could improve fitness and health profiles of middle-aged men after 10 weeks of training. Twenty-four healthy men aged 35–55 were randomized in a small-sided recreational volleyball group (RV = 12; age: 44.7 ± 6.34 years; body mass index: 25.85 ± 1.74) and control group (CON = 12; age: 42.9 ± 8.72 years; body mass index: 25.62 ± 1.48). Results indicated the recreational small-sided volleyball can be an effective training modality to stimulate a decrease in LDL cholesterol and resting HR with small improvements in cardiovascular fitness.
- ❖ **Ferrari et al. (2021)** conducted a study to evaluate the effect of beach tennis training on ambulatory blood pressure and physical fitness in individuals with hypertension. Methods: This study will be a randomized, single-blinded, two-arm, parallel and superiority trial. Forty-two participants aged 35–65 years with previous diagnosis of hypertension will be randomized to 12 weeks of beach tennis training group (two sessions per week lasting 45–60 min) or a non-exercising control group. Ambulatory (primary outcome) and office blood pressures, cardio respiratory fitness, muscle strength/power and quality of life will be assessed at baseline and after the intervention period. The results indicated the Recreational beach tennis has the potential to be used as a retention and continuity strategy, promoting a broad-spectrum of health improvements associated with pleasure and satisfaction during physical activity.

SUMMARY OF RELATED LITERATURE

The literature presented in this chapter indicates many positive health benefits associated with regular physical activity or various types of exercise. Although there are number of studies in relation to exercise and health benefits but there are no studies conducted so far on the impact of recreational games. Hence, researcher of

this study attempted to relate the studies in relation to exercise, as the recreational games consist of physical postures and energy expenditure similar to other exercises. Moreover, from the literature it is evident that exercise is beneficial for improving Psycho-Neuro-Physiological parameters. Overall reviews suggest that the present study involving physical activities in relation to recreational games is new in India and may help the adult tribals population to lead a healthy life in enriching health related physical fitness and its associated variables.



CHAPTER

3



METHODOLOGY

Chapter III

METHODOLOGY

Research methodology concerned systematic procedure by which the research started from the initial identification of the problem to its final conclusions. The role of the methodology was to take out the research work in a scientific and validated manner.

In this chapter, the methodology employed on the topic **“IMPACT OF RECREATIONAL GAMES ON PSYCHO-NEURO-PHYSIOLOGICAL VARIABLES OF ADULT TRIBALS”** was Selection of subjects, Selection of variables, Flow chart showing the methodology adopted in the Study, Selection of Tests, Administration of the Tests, Collection of Data, Reliability of Data, Training schedule, Administration of the Recreational Games, Pilot study, Design of the Study, Statistical procedure and Level of Significance adopted have been explained.

SELECTION OF SUBJECTS

For the present study, 40 adult tribals were randomly selected for the study from village Pandri, Bankura district in West Bengal. The age of all the subjects utilized in the study was within the range of 50-55 years. The subjects were divided into two experimental groups, named as Group ‘M’ (Male) and Group ‘F’ (Female). Each group consisted of twenty (N=20) subjects for the training period of Sixteen (16) Weeks. The purpose of the study was clearly explained to the subjects so as to get full co-operation of the effort required on their part and prior to the administration of the study. It was ensured from the health examination records of the subjects that all of them were medically fit.

SELECTION OF VARIABLES

The research scholar reviewed the various scientific literatures pertaining to the recreational games of different packages on selected Psycho-Neuro-Physiological variables from books, journals, periodicals, magazines and research papers. Taking into consideration of feasibility criteria, availability of instruments and the relevance

of the independent and dependent variables in the present study, the following variables were selected.

INDEPENDENT VARIABLES:

- Recreational games.

DEPENDENT VARIABLES:

Psychological Variables

- Self Esteem.
- Life Satisfaction.
- Locus of Control.
- Self Efficacy.

Neuropsychological Variables

- Illusion.
- Tactile Sense.
- Hand Eye Co-ordination.
- Gross movement of hands, finger and arms.
- Depth Perception.
- Reaction Time.

Physiological Variables

- Resting Heart Rate.
- Systolic Blood Pressure.
- Diastolic Blood Pressure.

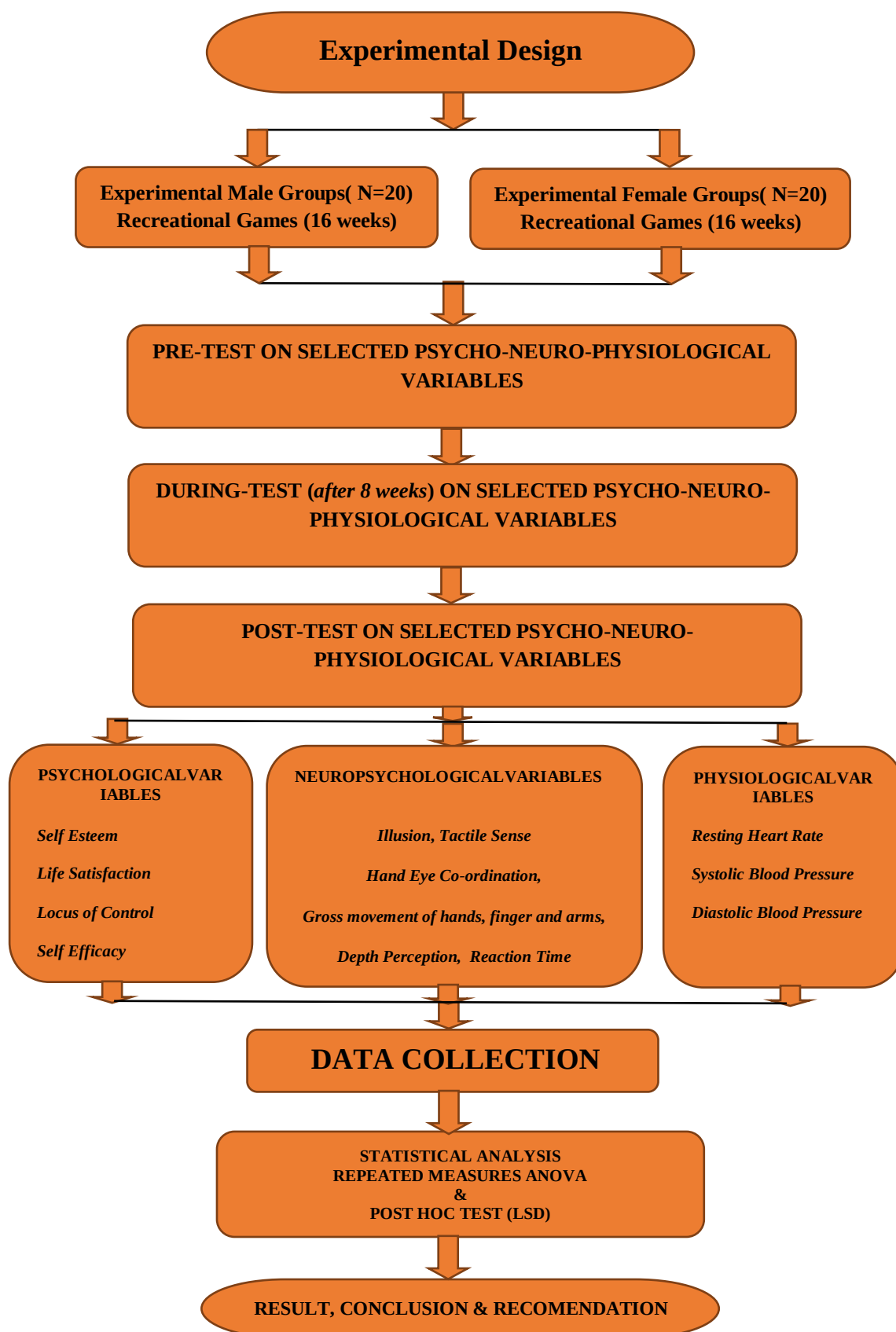


Figure-1: Flow Chart Showing the Methodology Adopted In the Study

SELECTION OF TESTS

The present study was undertaken to study the impact of recreational games on Psycho-Neuro-Physiological variables of adult tribals. As per the available literature, the following standardized tests and procedures were used to assess the selected dependent variables which are presented in Table-1.

TABLE-1

S.No	Criterion Variables		Test/Instruments	Unit of Measurement
1	Psychological	Self Esteem	Self esteem scale by Dr. Santosh Dhar and Dr. Upinder Dhar	Numbers
2		Life Satisfaction	Life satisfaction scale by Prof. Hardeo Ojha	
3		Locus of Control	Locus of control scale by Sanjoy Vohra	
4		Self Efficacy	Self efficacy scale by Dr. A. K Singh and Dr. Shruti Narayan	
5	Neuropsychological	Illusion	Muller layer Visual illusion Test	Centimeters
6		Tactile Sense	Aesthesiometer	Millimeters
7		Hand Eye Co-ordination	Mirror drawing test	Seconds
8		Gross movement of hands, finger and arms	Finger Dexterity Test	Seconds
9		Depth Perception	Howard and Dolman apparatus	Centimeters
10		Reaction Time (Audio and Visual)	Reaction Time Apparatus	Seconds
11	Physiological	Resting Heart Rate	Pulse Oximeter	Beats/min
12		Systolic Blood Pressure	Blood pressure monitor	mmHg
13		Diastolic Blood Pressure	Blood pressure monitor	mmHg

ADMINISTRATION OF THE TESTS

❖ PSYCHOLOGICAL VARIABLES

SELF ESTEEM (Dhar and Dhar, 2015)

Title: Self esteem scale by Dr. Santosh Dhar and Dr. Upinder Dhar

Purpose : To determine the Self esteem of the subjects.

Reliability: The reliability of the scale was determined by the split-half method corrected for full length by applying Spearman Brown Prophecy formula on the data collected from the sample of 277 subjects. The reliability coefficient was found to be 0.87.

Description: The Self esteem scale provided six factors. Six factors were Positivity, Openness, Competence, Humility, Self-Worth and Learning Orientation.

Factor 1. Positivity : It is constituted of item 5- capable to cope difficult situations (.59); item 8 enjoying to overcome challenging situations (.49); item 9- taking social responsibility (.50); item 13- view mistakes as learning opportunities (.60); item 17- managing stress effectively (.67); and item 18- enjoying life (.29) with a Mal factor load of 3.14 and 10.4 percent of variance.

Factor 2. Openness : It is constituted of item 14-taking constructive feedback (.74); item 15 believing in self awareness (.52); item 16- adding value to the team (.49) ; item 20- credit to other peoples' thought (.49) and item 21- openness of thoughts (.54); with a total factor load of 2.78 and 8.8 percent of variance.

Factor 3. Competence: It is constituted of item 1- positive thinking (.62); item 2- belief in one's own strength (.79); and item 3- ability to perform tasks (.71); with a total factor load of 2.12 and 8.6 percent of variance.

Factor 4. Humility : It is constituted of item 4- knowing job well (.40); item 6- value others (.72); item 7- feeling good about oneself (.50); and item 10- admitting failures (.51); with a total factor load of 2.13 and 8.2 percent of variance.

Factor 5. Self Worth: It is constituted of item 19-awareness about negative thoughts (.62); item 22- good listener (.59); and item 23- belief in having more strength than weaknesses (.65); with a total factor load of 1.86 and 7.9 percent of variance.

Factor 6. Learning Orientation: It is constituted of item 11- perfection in work (.68) and item 12- developing new skills (.66) with a total factor load of 1.34 and 7.8 percent of variance.

Scoring:

This instruments/scale may be administered on the individuals regardless of age, gender and educational background. It should be emphasized that there are no right and wrong answers to the statements. All the statements have to be answered in terms of strongly disagree, disagree, not sure, agree or strongly agree. Each item which is checked as strongly disagree, disagree, not sure, agree or strongly agree should be awarded the score of 1, 2, 3, 4 and 5 respectively.

Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1	2	3	4	5

It is not desirable to tell respondents the exact purpose for which the scale is used, before administration of the scale. Higher the score of a Factor of the self-esteem, higher is that Factor. Total score is the reflection of the overall self-esteem. Higher the total score, higher the self-esteem.

LIFE SATISFACTION (Ojha, 2015)

Title: Life satisfaction scale by Prof. Hardeo Ojha

Purpose : To assess the life satisfaction of an individual.

Reliability: The reliability of the scale was determined by the split-half method and it was found to be 0.83 for the total items measure.

Description:

The final scale consisted of only 20 items. Out of 20, 12 items were in positive direction indicating satisfaction with life and 8 were in negative direction indicating dissatisfaction with life. The serial numbers of positive and negative items are mentioned in bellow.

Items	Serial Numbers	Total
Positive	1, 2, 4, 6, 7, 9, 10, 11, 13 14, 17, 19	12
Negative	3, 5, 8, 12, 15, 16, 18, 20	8
	Total	20

Scoring:

The scale has 20 items and the testee is supposed to give his response on Five- point likert-type alternatives, viz., Strong Agree, Agree, Undecided, Disagree and Strongly Disagree. The testee is supposed to put a mark in the appropriate cell which is nearer to his response for each item. Scoring System is as following.

Sr. No	Type of Items	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I.	Positive	5	4	3	2	1
II.	Negative	1	2	3	4	5

LOCUS OF CONTROL (Vohra, 1999)

Title: Locus of control scale by Sanjoy Vohra

Purpose : To determine the Locus of control of the subjects.

Reliability: Reliability of the inventory was found by the test retest method, and it was found to be 0.76.

Description:

The final scale consists of 24 statements, 8 each for P-powerful others, C- Chance control and I-individual control. These statements have thoroughly been revised and edited before being included in the final scale. The statements are presented in a random order as follows:

Statements 3, 8, 11, 13, 15, 17, 20, 22 for P- powerful others,

Statements 2, 6, 7, 10, 12, 14, 16, 24 for C- chance control,

And statements 1, 4, 5, 9, 18, 19, 21, 23 for I- individual control.

P= Belief about control by powerful others. High scores indicate that other people control your outcomes.

C= Belief about chance control. High scores indicate that unordered, chance, or random events control your outcomes.

I= Belief about individual control. High scores indicate you believe that your outcomes are controlled by you - which your current situations and your rewards are direct outcomes of things you control.

Scoring:

The present scale is Likert Type Scale, with multiple choice responses presented in a continuum. Responses range from Strongly Agree, Agree, Undecided, Disagree to Strongly Disagree. In this five point scale, the responses are given weight from 1 to 5 as shown below:

5 Strongly Agree

4 Agree

3 Undecided

2 Disagree

1 Strongly Disagree

Approximately 150 statements were selected with an attempt to cover the whole range, i.e. powerful others, chance control and individual control, rather evenly. These statements were then edited and only those which were to the point and short were selected. Care was also taken that the statements were in such a form that the idea they were conveying can be either accepted or rejected. Double barreled, incomplete, and ambiguous statements were excluded from the list.

SELF EFFICACY (Singh and Narayan, 2014)

Title: Self efficacy scale by Dr. A. K Singh and Dr. Shruti Narayan

Purpose : To assess the Self efficacy of an individual.

Reliability: The test retest reliability was calculated and was found to be 0.82.

Description:

After extensive review of literature, following four dimensions were finally included in this scale. A brief description of each of these dimensions is under:

a) Self-confidence-The faith in oneself and in one's own abilities to perform a certain task or to arrive at a certain goal.

b) Efficacy expectation-The conviction that the person himself can successfully produce the behaviour required to generate the particular outcome. It determine show hard people will try and how long they will persist at a particular behaviour.

c) Positive attitude- A positive attitude is seeing the glass half full. It means to keep a set of ideas, values and thoughts that tend to look for the good, to advance and overcome problems, to find the opportunities in every situation, and to look, as it is said, 'on the bright side of life'. It also means to have courage and exceed oneself, getting up whenever one falls.

d) Outcome expectation- A person's belief that a given behaviour will lead to a particular outcome.

Division of the items

Sr. No	Division of items	Serialwise Item No	Total
I.	Self-confidence	1, 2, 3, 4, 5	5
II.	Efficacy expectation	6, 7, 8, 9, 10	5
III.	Positive attitude	11, 12, 13, 14, 15	5
IV.	Outcome expectation	16, 17, 18, 19, 20	5
		Total	20

Scoring:

The scoring of positive items of SE Scale was done by giving a score 5, 4, 3, 2 or 1 for Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree respectively and negative items were scored as 1, 2, 3, 4 and 5 respectively.

Scoring System

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

Scores thus obtained were added together to yield total score. The details of scoring are being provided in Table.

Scoring Table

Positive Items	Items No. 1,2 ,3 ,5,6,7,8 ,9 ,11,13 14,15,16,17,19 and 20
Negative Items	Items No. 4, 10, 12 and 18



Picture 1: Psychological Test.

❖ NEUROPSYCHOLOGICAL VARIABLES

MULLER LAYER VISUAL ILLUSION TEST (Manual for Muller Lyer illusion, 2005)

Purpose: To measure the Illusion

Equipment: Muller Lyer Illusion Board: The board is made as fiber sheet. Its length about 45 cm. it is fixed on two Aluminum Road on the stand. Muller Lyer Illusion is detachable from the Iron Roads. There are two side of Muller Lyer Illusion. In front side fixable and adjustable position of Muller Lyer Illusion. Standard Stimulus is 15 cm. In Back Side scale for measurement of illusion and two screw for fixing the rod.

Procedure: Instruction by the Researcher, the subjects were asked to move and adjust the longer line. So that both the lines would look equal in length, the subjects were asked to use both hands one by one following the description of the researcher. The subjects were to move the sliding part and make the equal distance until subjects' own choice.

Scoring: Ten trials of each Right out going, left out going, Right incoming and left incoming were taken. Average score of each trial were recorded. Then average of total outgoing of both left hand and Right hand and mean of total incoming of both left and Right hand were measured. Ultimately average mean score were calculated. Lower scores, lower mistakes and lower spending time-scores show best performance.



Picture 2: Measurement of Illusion

TACTILE SENSE (Instructional manual for method of minimal changes or limits, 2006)

Purpose: To measure the Tactile Sensitivity.

Equipments: Aesthesiometer, Pen

Aesthesiometer: It is a caliper formed of two pieces sliding across one another. One having a graduate scale and the other sliding part with one window also having scale on its sides. Two pointed projections; one each to each piece is attached. The distance between these two pointed projections can be increased and decreased through the sliding of sliding part of rider. The rider also have thumping wheel through which the rider is moved forward and backward. The zero distance between the two pointed projections gives a sensation of one point. It is known as Asthesiometer because it measures the sensitivity of the individual.

Procedure: A 2 inches long line was drawn on the front part of subject's forearm and subject was blind folded, so that, subject might be incapable to see the touch by Aesthesiometer. Now the experiment administration was started. First of all the rough threshold was found out. The 10 ascending and 10 descending trials were taken. The responses of the subjects were noted down.

Scoring: The point of transition of every ascending and descending responses were recorded. Total intermittently ascending and descending transition were recorded as score. Lower scores indicated better performances. The scores were measured in Millimeter.



Picture 3: Measurement of Tactile Sense.

MIRROR DRAWING TEST (Operational manual of mirror drawing apparatus, 2005)

Purpose: To measure the Hand Eye Co-ordination.

Equipments: Mirror drawing apparatus, Stop Watch.

Mirror drawing apparatus:

With this apparatus a metal star on a wooden box with a Base Board at the back side of which a Mirror Holder is attached to which Mirror can be fitted to stand vertical and at left hand of front side there is an adjustable screen and built in rectifier. Every metal star is connected electrically with a polygraph. The stylus with which Subject traces the star pattern is metal and is attached to one pole of an electrical circuit and the Pens of the polygraph to the other pole. When metal star is touched or crossed the circuit is close and the corresponding Pen is actuated with blinking the light.

Procedure: Subject was given three trails in which subject traced the ‘STAR’ pattern viewing its image in the Mirror with their dominant hand in the anti clockwise direction for right hand and clockwise direction for left hand. On hearing ‘START’ subject track the Star pattern with a stylus viewing its IMAGE in the Mirror. As the subject touched or crossed the inner or outer boundaries of the Star Pattern an Error is recorded. The subject was advised not to touch or cross the boundaries of the Star Pattern. All the Errors in each trail was marked and Counted by the experimenter manually and the time which taken in each trail was calculated by means of a Stop Watch. The time taken and Errors Committed in each trail were recorded in the data recorded sheet.

Scoring: Different errors along with time (Second) were taken as the score. Lower mistakes and low time detriment scores indicated best performance.



Picture 4: Measurement of Hand Eye Co-ordination.

FINGER DEXTERITY TEST (Operational manual for motor ability test, 2005)

Purpose: To measure the Gross movement of hands, finger and arms.

Equipments: Finger Dexterity Board, Pins and Stop Watch.

Finger Dexterity Board: It is made of plastics in a rectangular form, consist of hundred wholes in ten rows, ten wholes in each row, which are made on a steel plate fixed to it.

Procedure: An instrument was placed before the subject. The subjects was instructed to insert pins in those holes, which were to be inserted by dominant hand by using either right Hand or left Hand. Hold the pins by the Right Hand of the subjects for right handed and hold the pins by the Left Hand of the subjects for left handed so that, the subjects might not face any trouble in picking up the pins. The correct condition of insertion of pins was to start by insertion from right side of the right handed subjects and then from left to right repeating in the same way and left handed subject insertion of pins might be started from left Hand side to Right Hand side and then from Right Hand side to left Hand side repeating it till the work was finished.

Scoring: Counting of errors (Numbers) in the Finger dexterity board was very important. The time (Second) was recorded by the stop watch. Errors were committed when the pins were not inserted correctly or slanting or otherwise, or were fallen. Insertion of 100 pins in 100 wholes would count one trail. Lower mistakes and lower expend time-scores showed better performance.



Picture 5: Measurement of Gross movement of hands, finger and arms.

DEPTH PERCEPTION (Manual of Depth Perception apparatus, 2014)

Purpose: To measure the ability of subjects to judge the distance of objects or relative distances.

Equipment: Depth perception apparatus.

Depth perception apparatus: The three needle apparatus has been widely used in studies of Binocular Depth Perception. It was devised by Howard and Dolman. This belongs of an elongated box which conceals inside three vertical rods or pins. These pins can be seen by a subject through a small whole and the inside of the box is lighted. Two of these rods are fixed and the one in the middle is movable, resting on a pulley bottom wheeled on a road running completely across the length of the box. A meter-scale is fixed to the groove like opening on the top so that the exact position of the movable rod can be read. Depth perception box was a hollow wooden box which had a metric scale on its top. This scale had the zero-point at its middle and it was calibrated into fifty centimeters at each side of the zero-point.

Procedure: The subject was seated on a stool at the opening end. The height of the stool should be adjusted in such a way that when seated on it, the subject's eyes should be at level with the observational slit seeing the rods against the lighted background. The tester stood at the right side of the box and moved the middle from the illuminated end of the box towards the middle of the box. The subject was instructed to immediately indicate the moment he could see the middle rod to be in line with those two fixed rods. The variation from the mid zero-point was recorded from the metric scale. The same procedure was repeated while moving the movable rod from the slit end towards the middle of the box.

Scoring: Three trials were provided to each subject in each direction. The minimum score was obtained out of three trials and was rounded off to the nearest centimeter. Thus two sets of score were obtained, i.e. while moving rod from lighted end and slit end towards the middle of the box. Co-relation was recorded between these two sets of scores and on the basis of high correlation co- efficient any one of the set of scores was taken as depth perception score of the subjects.



Picture 6: Measurement of Depth Perception.

REACTION TIME (AUDIO AND VISUAL) (Debnath, 2005)

Purpose: To determine the simple reaction for visual and auditory stimuli.

Equipment: Reaction Time Apparatus

Procedure: For measurement of reaction time the apparatus was set as to divide into two sides (opposite direction) the subject side and the tester's side. The subject sat in a chair on subject side and tester sat on the tester's side. The tester chose the audio-visual mode and presses the start switch, which gave a signal for the subject to press the visual or audio key as selected by the tester with selector switch and also started the reaction timer. The subject was told to concentrate to the stimulus provided by researcher and to react as soon as possible to the stimulus. Then the tester pressed one of the short keys giving the required stimulus (light/sound) the start on key which gave the stimulus. As soon as the subject received the light or sound stimulus he press his finger on the right or left key, which stopped the reaction timer and the reaction time to the light stimulus reached and recorded from the reaction timer. Three trials was provided to each subject.

Scoring: Three trials were permitted to each subject for both stimulus (audio and visual) and the average of the three timings was taken as an individual score.



Picture 7: Measurement of Reaction Time.

❖ PHYSIOLOGICAL VARIABLES

RESTING HEART RATE (Iyriboz et al., 1991)

Purpose: To measure the Resting heart rate.

Equipment: Pulse Oximeter (heart rate monitor).

Procedure: The resting heart rate of each of the subjects was recorded between 6.00 A.M. to 7.00 A.M. The participant's heart rate was measured using the Pulse Ox (heart rate monitor). The heart rate monitor was placed on the participant's non-dominant index finger. Before recording the resting heart rate, the subjects were instructed to remain lying on their bed.

Scoring: The score was expressed in terms of number of pulse beats per minute.



Picture 8: Measurement of Resting heart rate.

BLOOD PRESSURE (SYSTOLIC AND DIASTOLIC) (Lewis et al., 2002)

Purpose: To measure the Blood Pressure.

Equipment: automatic upper arm blood pressure monitor.

Procedure: Subjects were familiarized with test procedures. Blood pressure were determined from 6.00 A.M. to 7.00 A.M. under standardized conditions after an overnight fast. Blood pressure was measured at least six times by an automatic upper arm blood pressure monitor and an average value was calculated. Before recording the resting heart rate, the subjects were instructed to remain lying on their bed.

Scoring: The systolic pressure and diastolic pressure (mm/Hg) reading recorded for each subject.



Picture 9: Measurement of Blood Pressure.

COLLECTION OF DATA

The recreational games were given as per the training schedule of Sixteen weeks. Data were collected in three phases such as the pre-test i.e. at the beginning of the programme session, the during-test or mid-test i.e. after the eight week of the programme session and post test i.e. after the sixteen week of the training session on the selected criterion variables.

The data on selected dependent variables for pre-tests, mid-test and post-tests were collected two days before and after the training programme respectively. On the first day morning Resting Heart Rate, Systolic Blood Pressure and Diastolic Blood Pressure and evening Hand Eye Co-ordination, Self Esteem and Life Satisfaction were tested and also in morning Illusion, Tactile Sense, Reaction Time and Depth Perception and Gross movement of hands, finger and arms, Locus of Control and Self Efficacy in evening were tested on the second day.

RELIABILITY OF DATA

The reliability of data was ensured by establishing the Tester's competency, Subject reliability and Instrument reliability.

TESTER'S COMPETENCY

Reliability was established by the test-retest processes. Forty participants from both groups were tested on selected variables. The repeated measurement of individuals on the same test is done to determine reliability. The data on different variables was obtained by the investigator himself with the help of supervisor working in the field of physical education and his fellow assistants. The investigator already had theoretical as well as practical knowledge of using these equipment for the measurement. Thus they were regarded competent enough for the purpose of the present study. Tester

reliability in conducting tests on Self Esteem, Life Satisfaction, Locus of Control, Self Efficacy, Illusion, Tactile Sense, Hand Eye Co-ordination, Gross movement of hands, finger and arms, Depth Perception, Reaction Time, Resting Heart Rate, Systolic Blood Pressure and Diastolic Blood Pressure was established by test retest process.

Thereby consistencies of results of the score were obtained by Researcher and by the expert on randomly selected sample. The co-efficient of correlation is presented in Table-2.

Table-2
Coefficient of Correlation for Tester Reliability in Neuropsychological and Physiological Variables

S.No	Variables	Coefficient of Correlation
1	Illusion	0.92*
2	Tactile Sense	0.96*
3	Hand Eye Co-ordination	0.98*
4	Gross movement of hands, finger and arms	0.98*
5	Depth Perception	0.88*
6	Reaction Time	0.89*
7	Resting Heart Rate	0.97*
8	Systolic Blood Pressure	0.95*
9	Diastolic Blood Pressure	0.85*

*Significant at 0.05 level of confidence

SUBJECTS RELIABILITY

The intra class correlation value of the above test and retest also indicated subject reliability as the same subjects were used under similar conditions by the same tester.

RELIABILITY OF THE INSTRUMENTS

For the measurement of the test results, the investigator used Finger Dexterity Board, Mirror Drawing Apparatus, Muller layer Visual illusion Board, Aesthesiometer and Howard and Dolman apparatus. All the materials were manufactured by reputed company (National psychological corporation, Agra). The Reaction Time Apparatus, Stop watches, Automatic digital blood pressure monitor (SENSE Q-As series; New

Delhi) and Pulse oximeter (k-Life FTP-103) also used in recording the data on selected variables were considered reliable. All the instruments used were standard and therefore their calibrations were accepted accurate enough for the purpose of the study and these instruments are being widely used throughout the India for research purpose. For that result were considered as reliable for conducting the present study.

As for psychological variables self esteem, Life satisfaction, Locus of control and Self efficacy, the authors of the questionnaire have determined reliability and the same was adapted for this study and considered as reliable.

TRAINING SCHEDULE

The subjects were assembled in a common place, which has adequate space for training programme. Each day programme lasted for a total period of 35 minutes including assembly and dispersal in first four weeks, which was increased to 45, 55 and 65 minutes including assembly and dispersal during five to eight weeks, nine to twelve weeks and thirteen to sixteen weeks respectively. The participants in adult male and female tribals performed recreational games and received guidance in experimental protocol, during 16 weeks, with 48 sessions of 35 to 65 minutes each, three day a week in alternate days. Each session comprised 5 minutes of warming up exercises, 24 to 48 minutes of recreational activities on the basis of low to moderate (different types recreational games) and 4-7 minutes warm down exercises. The participants were subjected to first four weeks of Low Intensity and five to sixteen weeks Moderate Intensity of Recreational games respectively. The training program was scheduled in the evening between 3.15 pm to 4.30 pm.

To get a significant and authentic result, 16 weeks time duration was taken for this final study where the progressive increase of the load was done by increasing the duration (volume) of the workout session by 10 minutes after every four weeks and increasing the intensity of the workout session by 5% after every four weeks. Recreational games were planned and directed by the supervisor and experts to ensure that the participants would be active throughout the period doing activities at a low to moderate for maintaining progression of load. The detailed training schedule is presented in the table below.

TABLE-3
TRAINING SCHEDULE FOR EXPERIMENTAL GROUPS

Type	Recreational Games.
Intensity	60%-75% of maximum heart rate.
Duration	35 minutes (5 mts warm up + 24 mts recreational games work out + 2 mts recovery time + 4 mts warm down) for first 4 weeks; 45 minutes (5 mts warm up + 32 mts recreational games work out + 3 mts recovery time +5 mts warm down) for second 4 weeks; 55 minutes (5 mts warm up + 40 mts recreational games work out + 4 mts recovery time + 6 mts warm down) for third 4 weeks and 65 minutes (5 mts warm up + 48 mts recreational games work out + 5 mts recovery time + 7 mts warm down) for last 4 weeks.
Frequency	3days per week (Monday, Wednesday and Friday for male and Tuesday, Thursday and Saturday for female)
Recreational games Schedule	✓ Recreational games routine had applied in four schedules with proportional enhancement in intensity. ✓ Intensity of the recreational games training schedule had been changed in every four weeks by increasing the repetitions.

TRAINING SCHEDULE OF RECREATIONAL GAMES

Training Schedule was conducted systematically to improve the performance of selected criterion variables. The detailed training schedule is presented in the table below.

TABLE-4

1st MONTH TRAINING SCHEDULE ON RECREATIONAL GAMES FOR MALE AND FEMALE ADULT TRIBAL

Weeks	Day	Recreational games	Duration (In Minutes)	Repetition	Recovery between two games (In Minutes)	Intensity	Total Duration (In Minutes)
I to IV	Monday(male) / Tuesday(female)	Warm up	5	1	1 (Total 2)	60%	35
		1. Ball throw relay 2. Crow and cranes 3. Find the leader	24 (3x8)				
		Warm down	4				
	Wednesday(male) / Thursday (female)	Warm up	5	1	1 (Total 2)	60%	35
		1. Target roll 2. Fox, gun, hunter 3. In the pond on the bank	24 (3x8)				
		Warm down	4				
	Friday(male)/ Saturday(female)	Warm up	5	1	1 (Total 2)	60%	35
		1. Overhead passing relay 2. Ying yang you back 3. Target pass	24 (3x8)				
		Warm down	4				

Total nine recreational games (3 games per session) were performed by the subjects. Every game was of eight minutes and there was recovery of one minute in between two games with warm up of 5 minutes and warm down of 4 minutes (Games 3 x 8 minutes = 24 minutes + recovery 2 minutes in respect of 3 games + 9 minutes for warm up and warm down = 35 minutes total duration).

**2nd MONTH TRAINING SCHEDULE ON RECREATIONAL GAMES
FOR MALE AND FEMALE ADULT TRIBALS**

Weeks	Day	Recreational games	Duration (In Minutes)	Repetition	Recovery between two games (In Minutes)	Intensity	Total Duration (In Minutes)
V to VIII	Monday(male) / Tuesday(female)	Warm up	5	2	1(Total 3)	65%	45
		1. Over and under Passing relay 2. Skin the snake 3. Walking relay 4. Simple file relay method	32 (4x8)				
		Warm down	5				
	Wednesday(male)/ Thursday (female)	Warm up	5	2	1(Total 3)	65%	45
		1. Tunnel ball relay 2. Arch ball relay 3. Arm roll relay 4. Round ball	32 (4x8)				
		Warm down	5				
	Friday(male)/ Saturday(female)	Warm up	5	2	1(Total 3)	65%	45
		1. Side line ball 2. Dodge ball 3. Snatch the kerchief 4. Circle ball passing	32 (4x8)				
		Warm down	5				

The total number of recreational games were increased to twelve (4 games per session) in the next four weeks and were performed by the subjects with 2 repetitions. Every game was of eight minutes (including repetition) and there was recovery of one minutes (including repetition) in between two games with warm up of 5 minutes and warm down was increased to 5 minute compared to the previous weeks (Games 4 x 8 minutes = 32 minutes + recovery 3 minutes in respect of 4 games + 10 minute for warm up and warm down = 45 minutes total duration).

3rd MONTH TRAINING SCHEDULE ON RECREATIONAL GAMES FOR MALE AND FEMALE ADULT TRIBALS

Weeks	Day	Recreational games	Duration (In Minutes)	Repetition	Recovery between two games (In Minutes)	Intensity	Total Duration (In Minutes)
IX to XII	Monday(male) / Tuesday(female)	Warm up	5	1	1 (Total 4)	70%	55
		1. Mother carey's chickens 2. Move down or up 3. Snatch ball 4. Good morning 5. Spoke relay method	40 (5x8)				
		Warm down	6				
	Wednesday(male) / Thursday (female)	Warm up	5	1	1 (Total 4)	70%	55
		1. All up relay 2. Ball bounce relay 3. Crocodile chase 4. Hurry ball 5. Line champion ball	40 (5x8)				
		Warm down	6				
	Friday(male)/ Saturday(female)	Warm up	5	1	1 (Total 4)	70%	55
		1. Outside tag ball 2. Progressive dodge ball 3. Shifting the Indian club 4. Stake snatch 5. Waist catch	40 (5x8)				
		Warm down	6				

The total number of games were increased to fifteen (5 games per session) in the next four weeks and were performed by the subjects. Every game was of eight minutes and there was recovery of one minute in between two games with warm up of 5 minutes and warm down was increased to 6 minute compared to the previous weeks (Games 5 x 8 minutes = 40 minutes + recovery 4 minutes in respect of 4 games + 11 minutes for warm up and warm down = 55 minutes total duration).

**4th MONTH TRAINING SCHEDULE ON RECREATIONAL GAMES
FOR MALE AND FEMALE ADULT TRIBALS**

Weeks	Day	Recreational games	Duration (In Minutes)	Repetition	Recovery between two games (In Minutes)	Intensity	Total Duration (In Minutes)
XIII to XVI	Monday(male) / Tuesday(female)	Warm up	5	2	1 (Total 5)	75%	65
		1. Bounce and pass relay 2. All up and all down relay 3. Broncho tag 4. Ball roll relay 5. Backward running relay 6. Dog and cat	48 (6x8)				
		Warm down	7				
	Wednesday(male) / Thursday (female)	Warm up	5	2	1 (Total 5)	75%	65
		1. Load down Shuttle relay 2. Double circle fill the gap 3. Head and tail 4. Hunter and hunted 5. Sewing up the gaps 6. Sore toe relay	48 (6x8)				
		Warm down	7				
	Friday(male)/ Saturday(female)	Warm up	5	2	1 (Total 5)	75%	65
		1. Square relay 2. Tower ball 3. Triple chase 4. Potato race 5. Ball pass and run relay 6. Zig - zag relay	48 (6x8)				
		Warm down	7				

The total number of games were increased to eighteen (6 games per session) in the next four weeks and were performed by the subjects with 2 repetition. Every game was of eight minutes (including repetition) and there was recovery of one minute (including repetition) in between two games with warm up of 5 minutes and warm down was increased to 7 minutes compared to the previous weeks (Games 6 x 8 minutes = 48 minutes + recovery 5 minutes in respect of 6 games + 12 minutes for warm up and warm down = 65 minutes total duration).

PRESCRIPTION OF INTENSITY

The karvonen formula was used to bring down the intensity (Target Heart Rate Zone) for each individual (Swain and Leutholtz, 2007). The intensity of the exercise was increased once in four weeks by 5% of the maximum heart rate. In addition to this, resting heart rate was also checked at the beginning of every week to prescribe the new target heart rate.

Thus, intensity for the recreational games training programme for the study was fixed between 60% to 75% of maximum HR. i.e. (101 to 126 beats per minute). Training heart rate was calculated by using “Karvonen Equation”(Ignaszewski et al., 2017).

THE KARVONEN FORMULA

Target Heart Rate = (Heart Rate Reserve X % Intensity) + resting Heart Rate

Step 1: Find out the Maximum Heart rate

Maximum Heart Rate = 220 - Age

Step 2: Find out the Resting Heart Rate

Step 3: Find out the Heart Rate Reserve

Heart Rate Reserve = Maximum Heart Rate - Resting Heart Rate

Step 4: Find out the Target Heart Rate

Target Heart Rate = (Heart Rate Reserve X % Intensity) + Resting Heart Rate

DESCRIPTION OF THE TRAINING SCHEDULE

Recreational Games Training

Experimental groups were exposed to recreational games training 5 minutes was allotted for warm up and stretching was performed by the subjects before the training sessions. After the warm up the recreational games were given 24 to 48 minutes. During the first four weeks the intensity was fixed 60% of their maximum heart rate and the subjects were asked to perform the recreation games in 24 minutes. The

intensity was increased by 5% once in every four weeks. 4 to 7 minutes was allotted in warm down process.

ADMINISTRATION OF THE RECREATIONAL GAMES

The following recreational games were used in experimental training.

1.1 BALL THROW RELAY

Equipments: Volleyball, measuring tape & marking powder

Description:

Establish two parallel lines from 14 to 25 mts. apart. Divide the subjects into two teams of equal numbers. Divide the teams in half and arrange each half in column, facing each other from opposite base lines; teams seven meters apart. Give the first subject of the "A" half of each team a ball. At signal, the subject with the ball throws it to the first subject of the "B" half, who receives it and throw it back to the second subject of the "A" half, who returns it to the second subject of "B" half. The ball is thrown back and forth. In this manner, each subject will be catching "B" half throws it to the first subject of "A" half. The last subject may only be thrown in back of the line and caught in back of the line.

Scoring: Either any subject a team dropping the ball the opposite group wins a point and must recover the ball himself and throw it.

1.2 CROW AND CRANES

Equipments: None

Description:

Assemble the subjects in open formation. Appoint half of the team "Crows" and the other half "Cranes" so that the individuals of each team stand alternately both laterally and longitudinally. On signal the instructor gives some calisthenics command such as "hands sideward", "squat", "sit", "jump forward", "touch toes", "feet apart" and so on and then says "Crows" or "Cranes". The team called executes the command; the other team remains still. Any member of the group called who fails to execute the command at once and any member of the group not called who executes or start to execute the commands is eliminated.

Scoring: The Instructor should take care to conceal, which team he is going to call each team an equal number of times. The game continues until half of one team is eliminated; the other team wins.

1.3 FIND THE LEADER

Equipments: Measuring tape & marking powder.

Description:

The subjects sit around in a large circle. Jim is chosen to be "it" and leaves the room. While he is gone, the subjects choose Mary to be their secret leader. Mary starts to clap hands, and the others follow suit, as Jim comes back into the room and re-enters the circle. He walks around inside the circle, trying to discover who the secret leader is. Meanwhile, Mary leads the others in such actions as clapping. Stamping, nodding the head, swinging arms, pretending to comb the hair, rocking back and forth, and anything else that can be done in a sitting position. It is best of Mary to change motions while Jim is not watching her directly. Since the group wants to prevent Jim from discovering who their leader is they do not keep their eyes glued on Mary, and they change, to follow her actions, as quickly as possible.

Scoring: Jim is given three chances to guess who the leader is? If he guesses correctly, Mary then becomes "It" and she loses a point. If not, chosen as "it" and fails to guess the leader again and again, Mary become wins a point and a new "it" should be chosen by the team.

1.4 TARGET ROLL

Equipments: Two volleyballs, measuring tape & marking powder.

Description:

The subjects was divided into two teams or equal members. The distance between the middle of the target circle and the restricting line was 5 meters. After the toss, the winning team takes the chance of rolling the ball first. Each subject of the team gets two chances to roll the ball into the target circle.

Scoring: If the rolled ball goes out of the circle, no point was awarded. The number or time: as ball lands in the circle was awarded one point. The number or points scored by the group comes its score and the points scored by all the subjects of the team become the score of the group.

1.4 FOX, GUN, HUNTER

Equipments: None

Description:

The subjects divide into two teams; a good size for each one is between five and ten subjects. The leader explains that each group may choose to be a fox, a gun, or a hunter. He points out that "a fox is superior to the hunter, because he can outwit and outrun him. The hunter is superior to the gun, because he can shoot it. The gun is superior to the fox, because it can kill him". This is the order of superiority. The fox defeats the man, the man defeats the gun and the gun defeats the fox. Each team chooses a captain. He helps them decide which they will be-fox, gun, or hunter. Then, lined up and facing the other group, at a signal, they show which they are as a group. If they are foxes, the entire team holds thumbs in their ears and point fingers like a fox's ears. If they are guns, they aim and pretend to shoot. If they are hunters, they cross arms in front of their chests. The game is repeated again and again, each time with the groups deciding afresh what they will be. They try to outwit the opposite team, sometimes by choosing the same role again and again, sometimes by rotating them cleverly.

Scoring:

This may be done in two ways. A winning total of 10 or 15 may be set up, with a group getting 1 point every team each time, the game being repeated until one group has lost all of its men to the other group. This second way may drag on endlessly, however, since it is chance rather than skill that usually determines winner.

1.6 IN THE POND ON THE BANK

Equipments: Marking powder

Description:

Arrange the subjects in a large circle. When the instructor or leader says "In the Pond" the subjects jump forward with both the legs and when the instructor says, 'on the bank', the students jump backward with both legs.

Scoring: If any subject does not perform the correct action according to the instructor's command, the eliminated. Similarly, if a subject does not move quickly he is also eliminated. The game continues until all but one is eliminated; the last person becomes the winner.

1.7 OVERHEAD PASSING RELAY

Equipments: Two volleyballs, measuring tape & marking powder.

Description:

Divide the subjects into teams and arrange them in files behind the starting line, facing front. A turning line is marked five metres in front of the starting line. Give the front subject of each team a ball. At a signal the ball is passed back over the heads of the subjects; the rear player on getting the ball runs forward to the turning line then returns and takes his place at the front of the line and passes the ball back again.

Scoring: This continues until the subject who was in front at first comes to the same place again and holds the ball up. The team doing this first wins.

1.8 YING, YANG, YOU, BACK

Equipments: None

Description:

Position subjects in a circle, each facing the center. Designate a player to start the game. The starter places her hand over her head, points to a player beside her (right hand points to the player on the left, left hand points to the player on the right) and shouts, "Ying!" The subject she pointed to responds immediately by pointing across her waist at another subject and shouting, "Yang!" This subject immediately extends his arm, points to someone across the circle and shouts, "You!" That subject then "Yings" a subject on the left or right, who "Yangs" the next player, who "Yous" the next player and so on.

Scoring: If subjects hesitate, do not call out the correct word (ying, yang, or you), or point incorrectly, they are out and sit in the middle of the circle. Another subject begins and play continues until one subject is left. That last remaining subject is the winner.

1.9 TARGET PASS

Equipments: Two volleyballs, flat wall, marking powder & a measuring tape.

Description:

The subjects were divided into two groups of equal numbers. After the toss, the winning group takes a chance of trying first. A one meter square was drawn on a wall using a chalk or tape. The bottom line of the square had to be one meter up from the

floor. A three meter square was marked on the floor 2.4 meters away from the wall. The subject must stand within the square.

Scoring:

The subject wins three points for hitting the wall inside the square, two points for hitting the lines of the square, two points for hitting the lines of the square and one point for hitting the wall but not in or on any part of the square. Either any subject catching the ball as it bounces back from the wall leaving his standing position in the square wins a additional one points and if the ball bounces before hitting the wall subject wins zero point.

2.1 OVER & UNDER PASSING & RELAY

Equipments: Volley balls, measuring tape & marking powder.

Description:

Divide the subjects into two equal groups. Arrange the subjects in each group in a row before the starting line. Let the subjects stay in the standing position. Give one volley ball to the first subject of each and every group. After hearing sound of the whistle by the instructor the first subject in each group raises his hand above to his head and passes the ball backwards passing it between his hands to the second subject in his row. The second student gives the ball to the third subject under his legs. Likewise one subject raises the ball upwards above his head and then throws it backwards and the next subject between his two legs to the next subject in his row and repeats the act.

Scoring: Like this other subjects in each and every group repeat these steps and finish the game. Whichever team finishes first was declared the winner.

2.2 SKIN THE SNAKE

Equipments: None

Description:

Divide subjects into groups and line up each team in single file. Subjects bend down and reach between their legs with their right hands to grasp the left hand of the player behind them. Subjects should extend their left hands forward. The subject in the back of the line sits down and then lies down, keeping her legs together and continuing to hold the right hand of the subject in front of her. The rest of the group backs up with small steps. The next to last subject sits down, then lies down, continuing to hold the right hand of the subject in front of him and the left hand of the subject behind him.

The team backs up with small steps. This continues until everyone is lying down, holding hands.

Scoring: Then the process is reversed. The last subject to lie down stands up walks forward with small steps, and pulls the next subject. This continues until everyone is standing up again. The group that "skins the snake" the fastest wins.

2.3 WALKING RELAY

Equipments: Marking powder

Description:

Arrange the groups in parallel columns of files, 3 mts. apart, abreast of a common line. Establish a turning point 20 mts. in front of each column. At signal, the first player of each group walks forward to or around the turning point and back to the starting line. In walking, a subject must place the heel of the advancing foot on the floor before the toe of the trailing foot is lifted. At the starting line the walker touches off the second player who repeats.

Scoring: This continues until all have walked. The group finishes first, wins.

2.4 SIMPLE FILE RELAY METHOD

Equipments: None

Description:

Arrange the groups in parallel files facing the starting line. Mark a turning line in front. At signal the first subject of each group runs to the turning line, returns and touches off the second subject. The second player runs and touches off the third subject.

Scoring: Continue until all have run. The group finishing first wins.

2.5 TUNNEL BALL RELAY

Equipments: Volley balls, Indian clubs & marking powder

Description:

Divide the subjects into two equal groups. Arrange subjects in each group to stand in a row a little behind the starting line. Draw a destination line in front of the starting line at a distance of 10 meters and put one Indian club straight before every team in the destination line. Give one volley ball to the first subject of each group. After

hearing the sound of the whistle by the instructor the first subject in each group takes the ball runs forward and goes round the Indian club in the destination line and runs towards his team, throws the ball between the legs to one of his team members. Once the ball reaches the last subject of each group then that subject takes the ball, runs forward and repeats the same procedure as done by the first subject.

Scoring: Similarly other subjects in the group repeat the same steps and finish the game. Whichever team finishes first was declared the winner.

2.6 ARCH BALL RELAY

Equipments: Two volleyballs, measuring tape & marking powder.

Description:

Arrange the groups in parallel columns of files 3 mts. apart abreast of a common line subjects standing so the chest of each touches the back of the subject in front. Give the first subject of each group a ball. Have all of the subjects raise their hands over head. At signal the first man in each column passes the ball backward over his head to the second subject, who passes it on to the third. The ball is passed in this way to the end of the column. The last man of the column catches the ball, runs, with it to the head of the column, steps in front of the column and passes it backward as before. The ball must be touched by each subject each time it is passed.

Scoring: This continues until all have run. The group which arrives in its original position first, wins.

2.7 ARM ROLL RELAY

Equipments:

Two volleyballs, measuring tape & marking powder.

Description:

Arrange the groups in parallel lines 3.5 mts. apart. Have the subjects of each group stand shoulder to shoulder, with arms raised forward and curved so all of the arms together form a trough. Give the first player of each group a ball. At signal, the first man in the column rolls the ball in the trough of arms. The other subjects of the group roll it toward the foot of the line. The last man receives it and carries it to the head of the line and rolls it in the trough toward the foot of the line. After throwing the ball

the player takes a position at the head of the line with his arms held forward. Each subject carries the ball forward in turn until all have run.

Scoring: The group arriving at its original formation first, wins.

2.8 ROUND BALL

Equipments: Two volleyballs, measuring tape & marking powder.

Description:

Place the group in a circle, subjects standing 1 mt. apart and facing in. Have the subjects number off around the circle; the "odds" form one team and the "evens" form the other. Give a ball to a subject of each group; these two subjects should be on opposite sides of the circle. At signal, each group passes its ball to the right; each passing it to subjects of its own team in their successive positions about the circle. Each team attempts to pass its ball so it catches up to the ball passes by their opponents. Every subject on each group must catch and pass the ball in his turn. Any man dropping the ball must regain the same himself and pass it to the next subject on his group; the pass may be made from the point of recovery.

Scoring: The groups which passes the ball so that it catches up with the opponent's ball, wins a point.

2.9 SIDE LINE BALL

Equipments: Volleyball, measuring tape & marking powder.

Description:

Establish a playing field 12 mts. square. Place all but four of the subjects in the playing field. Give one of the subjects standing on the side lines a ball. At signal, the subject with the ball throws it at the subjects in the centre, attempting to hit one of them. If the ball fails to hit a subject either on the fly, bounce, or roll, the subject whose side line it crosses recovers it and throws it at the subjects, attempting to hit one. The ball must always be thrown from the point where it crosses the side line. Each centre subject hit by the ball joins the subject who hit him and thereafter may throw the ball at the subjects remaining in the centre. When the ball comes to rest in the playing fields one of the runners should toss it to the smallest group on the side lines.

Scoring: The game continues until all have been eliminated. The team having the largest number at the conclusion of the play is the victor.

2.10. DODGE BALL

Equipments: Volleyball, measuring tape & marking powder.

Description:

Draw a circle measuring 10 meter in diameter. Divide the subjects into two equal groups. Make one group stand outside the circle and another inside it. Give a particular time of 5 to 10 minutes to the group which stands outside to throw the ball to these inside the circle so that it hits someone there below the knee. The subject who gets hit was declared out and moves out of the circle. The ball was always thrown from the outside by the outside group. After the fixed playing time is over for the outer group, this group moves inside the circle and the other moves outside.

Scoring: The outside group now repeats the same exercise. Whichever group was able to move more subjects out of the circle was declared as the winner.

2.11 SNATCH THE KERCHIEF

Equipments: Kerchief & marking powder

Description:

Divide the subjects into two equal groups. Draw two destination lines at a distance of 10 meter from the groups. Make the subjects stand on the line. Allot a number to each and every subject from number one, onwards. Draw a meters circle one diameter in the middle of the line and put a hand kerchief in the middle of the circle.

The instructor should stand in outside near the circle and call a number. Two subjects with the same number in both the groups come forward and try to pick up the handkerchief from the ground. The subject who snatches the kerchief runs towards his group avoiding the other subject from touching him and thus reaches as his team. When this happens, one point was scored by that team. If a subject of opposite team was able to touch the subject with the handkerchief that boy loses one point which was then awarded to the opposite group. Likewise the instructor will call different numbers to play the game in a particular time.

Scoring: Whichever team scores the largest number of points was declared the winner or whichever the team scores 10 points first becomes the winner.

2.12 CIRCLE BALL PASSING

Equipments: Volleyball, measuring tape & marking powder.

Description:

Arrange the subjects in the circle; subjects standing 2 mts. apart, facing in, Give one of the subjects a ball. At signal, the subjects pass the ball about the circle. As the ball passes about the circle. The instructor directs the manner in which it should be passed. Following are the principal manners to be used; (1) change-the direction of the ball around the circle is reversed; (2) face out-players all face out; (3) face in subjects all face in; (4) over head-ball is passed from above head; (5) under hand-ball is passed from below the waist; (6) push-ball is pushed from the chest ,with both hands; (7) left hand-ball is caught and thrown with the right hand; (8) between legs-ball is tossed back between legs.

Scoring: Either any subject a team dropping the ball the opposite group wins a point and the ball must recover it to the circle and then run one round the circle. Meanwhile the subjects in the circle pass the ball about as before.

3.1 MOTHER CAREY'S CHICKENS

Equipments: None

Description:

Here is a lively tag game, best played in teams of six to ten or twelve subjects. One subject is selected as the fox; he stands alone. The others line up, one behind the other. Each subject has his hands locked around the waist of the person in front of him. The person at the head of the line is called Mother Carey. All the subjects behind her in the line are Mother Carey's chickens. Mother Carey and the other chickens swing around, keeping their linked position, to protect this chicken from the fox, and it may take quite a while before the last person is tagged. When the fox finally manages to tag the last chicken, the game is repeated, with new subjects taking the part of Mother Carey, the fox, and the last chicken. To make the line's protection a little stronger, Mother Carey is allowed to attempt to ward the fox off with outstretched arms. There should be no striking or clutching of clothing to hold the fox back, however.

Scoring: The point of the game is for the fox to attempt to touch the last chicken in the line, the one at the end.

3.2 MOVE DOWN OR UP

Equipments: Volleyball, measuring tape & marking powder.

Description:

Divide the subjects into two teams of equal numbers; place them in parallel lines 17 mts. apart. Give one of the subjects a ball. At signal, the subject with the ball calls the name of one of the subject a ball. At signal, the subject with the ball calls the name of one of the subjects of the opposite team and throws the ball to him. The throw may be, (1) a roller. (2) a bounder, (3) a straight pitch, or (4) a fly; the thrower has his choice. The thrower should make his throw so it is fairly difficult to catch but not too difficult. The subject whose name is called attempts to catch it.

Scoring: If he muffs the ball, he moves down one exchange place, with the subject on his left. If he catches the ball he moves up one exchange place with subject on his right. The place of honour is to the right of the lines. Succeeding or failing, he secures the ball and calling a name of one of the subjects on the opposite line throws it to him. This subject moves up one or moves down one according to whether he catches the ball or fails. This player calls a subject of the opposite side and throws the ball, and so forth in this manner, the game continues.

3.3 SNATCH BALL

Equipments: Volleyball, measuring tape & marking powder.

Description:

Establish two line 10 mts. long and 15 mts. apart. Divide group into two groups of equal subjects and place them behind opposite base lines. Number each group consecutively from left to right. The instructor, holding a ball, takes position in the centre of the playing field. At signal, he throws the ball straight up to a height of about 7 meters, so it will fall directly in the centre of the playing field. As the ball leaves his hand he calls a number not greater than the numbers held by the subjects. Immediately after calling the number he steps to one side the centre. The two subjects bearing this number run forward to get the ball.

Scoring: Either subject getting that ball and returning across his base line with it score one point for his group. The ball must be carried over. If the ball rolls bounces, or flies over either line it is considered null. After the first subjects have finished the instructor recovers the ball and throws it up again, calling a number.

3.4 GOOD MORNING

Equipments: None

Description:

Arrange all the subjects except one in a circle close together and facing in. The extra subjects 'It' is outside the circle. 'It' runs around the circle and taps some subject on the back and continue the run. One who is tapped leaves the circle and runs in the opposite direction. They meet on the opposite side of the circle from the gap, they stop, shake hands, saying 'Good Morning', three times and then continue in their original directions to the gap.

Scoring: The subject who first reaches the gap steps into it and wins a point. The other subject becomes 'It' and continues the game.

3.5 SPOKE RELAY METHOD

Equipments: None

Description:

This is a good e of relay when space is too limited for straight races. Arrange the teams like the spokes in a wheel, radiating from a hub. At the signal the first subject of each spoke runs around the circle to the gut and tags off the second subject who repeats the first subject then takes his place at the hub end of the spoke Continue until all have run.

Scoring: The group finishing first wins.

3.6 ALL-UP RELAY

Equipments: Indian clubs, measuring tape & marking powder.

Description:

Directly opposite each group at the turning line, draw two circles on the floor, one metre in diameter and place three clubs in one. At the signal the first subject of each group runs to the club, picks them up using one hand only, and sets them up in the

other circle. He then returns and touches off the second subject, who runs to the clubs and places them back in the original circle. The third subject sets them in the other circle again and so on.

Scoring: If a club falls down before a runner reaches the starting line, he must return and set it up again. The group finishing first wins.

3.7 BALL BOUNCE RELAY

Equipments: Volley balls, Indian clubs, measuring tape & marking powder.

Description:

Divide the subjects into two equal teams. Arrange subjects in each team to stand in a row a little behind the starting line. Draw a destination line in front of the starting line at a distance of 10 meters and put one Indian club on it straight ahead of every team. Give one volley ball to the first subject of each team. After hearing the sound of the whistle the first subjects in each team bounce the ball on the ground, move forward and go round the Indian club in the destination line, return to his team and transfer the ball to the second subject while he goes and sits down as the last person in his row. The second subject repeats all the steps done by the first subject. The other subjects in the team also repeat the same steps and finish the game.

Scoring: Whichever team finishes first was declared the winner.

3.8 CROCODILE CHASE

Equipments: Ropes

Description:

Two pieces of rope each 8 mts. long are necessary for this game. Divide the subjects into two teams of equal numbers. Place each team in a column and give each one of the ropes which the subject holds in the left hand. At signal the head of each column chases the tail of the other.

Scoring: The group whose head subject succeeds in touching the tail subject of the opposing team first, wins.

3.9 HURRY BALL

Equipments: Balls, measuring tape & marking powder.

Description:

Arrange all but one of the teams in circle 5 mts. in diameter. Appoint the extras subject "It" give him a ball and place him in the centre of the circle. At signal, "It" tosses the ball into the air to a height of 5 meters so it will drop in the centre of the circle. As the ball come down "It" either catches it or lets it drop to the floor. If he catches it he attempts to touch one of the subjects with it before they can sit on the floor and raise their feet from the same. "It" must tag a subject with the ball in the hand and not throw it. Any subject fairly touched becomes "It" the old "It" exchanges places with him and he throws up the ball for the next play. If on the other hand, he lets the ball drop to the floor, the subjects are not required to sit on the floor; neither can "It" touch them in this case. A touched ball is considered caught. Any subject who makes above to sit down is eligible to have the ball thrown at him by "It" as soon as "It" recovers it. As soon as a subjects discovers his mistake he may run away from "It".

Scoring: Any subject hit by the ball thrown by "It" and "It" become wins a point. In this case, exchanges places with "It" and the game continues.

3.10 LINE CHAMPION BALL

Equipments: Balls, measuring tape & marking powder.

Description:

Establish two parallel lines 20 mts. Apart these are the throwing lines. Establish a third line halfway between and parallel to the throwing lines this is the standing line. Place all but two of the players standing at normal intervals in column on throwing line a ball. At signal, these subjects throw the ball simultaneously at the centre subjects in such a manner that the balls will hit one or more of them on the first bounce. The balls may be thrown from any position on the throwing line. The subjects on the standing line may dodge or twist and jump as they see fit to put off the balls, but they must keep on line. Any subject fairly hit is eliminated and takes the position of the subject who hit him; this subject withdraws altogether. After each hit the column closes its ranks to normal distances.

Scoring: After each throw the balls are recovered by the subjects, be they new or old, and thrown again. This continues until all have been eliminated. The last subject eliminated is the winner.

3.11 OUTSIDE TAG BALL

Equipments: Balls, measuring tape & marking powder.

Description:

Arrange all but two of the group in circle subjects standing a 1.50 mts. Interval facing in. Appoint the two selected "Its" and place them outside of and opposite sides of the circle. Give the subjects of the circle a ball. At signal, the subjects of the circle pass it about. The two "Its" by running about the outside of the circle endeavour to touch the ball. Either "It" touching the ball exchanges places the ball exchanges places with the subject responsible for his touching it. If the ball falls from to the floor the subject responsible must get it; if he has to break his position in the circle to do this.

Scoring: However, one of the "Its" may step into it if he can, wins a point. If an "It" gets a place in this way the absent subject becomes "It". The subject who are "It" are not allowed to enter the circle but must continue their activities to the outside.

3.12 PROGRESSIVE DODGE BALL

Equipments: Volley balls, measuring tape & marking powder.

Description:

Establish a field 20 mts. long and 7 mts. Wide the long sides are the base lines. Divide the team into three groups of equal subjects. Place group 1 in line back of one of the base lines, group 2 in back in back of the other base line and team 3 in the centre of the field. Give one of the subjects of group 1 a ball. At signal, the subject with the ball throws it at the subject in the centre. The subjects in the centre attempt to evade the ball. Any subject running out of bounds is eliminated and remains just outside of the side line. If the ball fails to hit a subject it is recovered by the subjects of group 2 and thrown at the subjects in the centre. In this way the ball is thrown back and forth. Any subject hit by the ball joins the group which threw the ball that hit him. The subjects of group 1 and group 2 may enter the field to recover the ball, but all throws must be made from behind the line.

Scoring: The throwing continues until all of the subjects of group 3 have been eliminated the number of subjects on group 1 and 2 are then counted. The group having the largest number wins. The group which won goes in the centre and group 3, which was in the centre, takes the vacated position on the base line.

3.13 SHIFTING THE INDIAN CLUB

Equipments: Indian clubs, measuring tape, marking powder & stops watch.

Description:

The group was divided into groups of equal subject. The teams stand behind the starting line. In front of each team, 6 meters away draw two circles of 1 meter diameter, on one of the circles, keep 3 Indian club standing. On signal the first subject of each group runs towards the circle, transfers all the all Indian clubs to the vacant circle, runs back and joins at the rear of the group. Then the second subject of each group runs and changes the clubs to the vacant circle.

Scoring: The game continues till the last subject completes turn. The group which finishes first was the winner.

3.14 STAKE SNATCH

Equipments: Indian clubs, measuring tape & marking powder.

Description:

Arrange the group in a circle 13 mts. in diameter. Divide the circle in half. Starting from the left of each half, give each subject a number, progressing consecutively to the right; subject with the same number will, therefore, be on opposite sides of the circle. Place a short stake, an Indian club or some similar object, in the field, standing on and in centre of the circle. Call a number not greater than the numbers given. The two subjects having this number run to the stake; here each attempt to snatch the stake and return to his starting position without being touched, one point is scored for his group. If touched by the opponent while carrying the stack, one point is scored for the group of the player who did the tagging.

Scoring: After the first subject have run the stake is replaced and director calls a new number. This continues until all have competed. The group scoring the highest of points wins.

3.15 WAIST CATCH

Equipments: None

Description:

Arrange all but two of the team in double circle, facing in the outside circle covering off the inside circle clasp the subjects two meters apart. Have the subjects in the

outside circle clasp the subjects of the inside circle about the waist of the two extra subjects appoint one chaser and the other runner. Place both appointees outside of the circle. At signal, chaser chases the runner, attempting to tag him; The runner may make himself exempt from tagging by jumping in front of any of the men of the inside circle and having that subject clasp him about the waist. When he does this he transfers his office to the rear subject who now becomes the runner. The subject in group rear may attempt to prevent the subject in front from clasping the runner by turning him to one side or the other, hauling him forward or backward, or by any other fair tactics he may devise.

Scoring: When chaser tags the subject he is chasing the two exchange offices and wins a point. The subjects must retain then circle formation and the game continue.

4.1 BOUNCE AND PASS RELAY

Equipments: Balls, marking powder & measuring tape.

Description:

Arrange the groups in parallel columns of files 3 mts. apart abreast of a common line, subjects in each column 1 mt. apart. Give the first subject in each column a ball (medicine, basket, soccer). At signal, the subject with the ball bounces it on the floor, and throws it back over his head to the second subject. The second subject catches the ball, bounces it on the floor, and throws it back over his head to the third subject. The third subject and all subjects behind him repeat. The last subject, in receiving the ball, runs forward to the front of the column, steps one meter in front of the leading subject, bounces the ball on the floor, and passes it back over his head. This continues until all have run forward.

Scoring: Whichever group finishes first was declared the champion.

4.2 ALL-UP AND ALL-DOWN RELAY

Equipments: Indian Clubs, marking powder & measuring tape.

Description:

The team was divided into groups of equal subject. Opposite to group team on the turning line, mark a circle one meter in diameter and in each circle keep four Indian clubs standing. At the signal, first subject of each team runs forward knocks the clubs

down, returns and touches off the second subject, who runs forward and sets the clubs up again. The third subject knocks them down, and so on.

Scoring: Thus the relay continues knocking and setting the clubs up until all have run. The group finishing first wins.

4.3 BRONCHO TAG

Equipments: None

Description:

Divide all but two of the subjects into groups of two and scatter them about the floor. Each pair is "Broncho"; one subject is the head and the other, who grasps him about the waist, is the tail. Of the two extra subjects appoint one "Chaser" and the other "Runner". At signal "chaser" chases and attempts to touch the runner who attempts to catch on to the tail of one of the "Bronchos". The "Bronchos" by running twisting and squirming attempts to avoid this.

Scoring: When the runner succeeds in catching a tail the head immediately becomes runner and win a point. If succeeds in catching a tail the head immediately becomes runner. If "chaser" succeeds in tagging the runner the two immediately reverse offices. In this way the game continues.

4.4 BALL ROLL RELAY

Equipments: Volley balls, measuring tape & marking powder.

Description:

Arrange the groups in parallel columns of files 3.5 mts. apart, abreast of a common line. Place one subject with feet spread, 14 mts. in front of each column. If a wall is available arrange the columns so these subjects may be placed abreast of it, two meters from the same. If no wall is available place an extra subject just beyond the one standing straddle legged. Draw a line half way between the subject standing with feet spread and the column; this is the throwing line. Give the first subject of each column a ball. At signal, the first subject runs forward to the throwing line: from here he attempts to roll the ball between the legs of the subject in front. If he is not successful he recovers the ball and tries gain from the same throwing line. The thrower has three trials. Upon making a successful throw or completing his third attempt, he returns the ball to the second player in the column, who repeats this

performance. The player standing forward with feet spread neither aids nor interferes with the throwers. The only duty of the subject beyond the one standing straddle legged, in case there is one, is to recover the ball and return it to the thrower.

Scoring: This continues until all have competed. The groups having its last subject recross the starting line with the ball first, wins.

4.5 BACKWARD RUNNING RELAY

Equipments: Indian Clubs, marking powder & measuring tape.

Description:

Based on the number of subjects divide them into two equal teams. Arrange each team in such a way that the subjects stand in a row before the starting line. Put the Indian club 10 meters away behind these subjects and draw a circle around the Indian club. After hearing the whistle of the instructor the first subject in each team runs backward goes round the Indian club and returns, then touches the second subject in his team and sits down as the last in his row. After the second subject in each team runs backwards as done by the first subject, returns touched the third subject in his team and sits down as the last in his row.

Scoring: Like that other subjects in his team repeat the same procedure and finish the round till the last student in each team. Whichever team finishes first was declared the winner.

4.5 BACKWARD RUNNING RELAY

Equipments: Marking powder & measuring tape.

Description:

Arrange the groups in parallel columns 3.5 mts. apart, abreast of a common line. Establish a turning point 15 mts. in front of each column. First subject of each column turn around so his back is toward the turning point. At signal, this subject, travelling backward, runs to or around the turning point and back to the starting line. On reaching the starting line he touches the second subject, who repeats.

Scoring: This continues until all have run. The group finishing first wins.

4.6 DOG AND CAT

Equipments: Marking powder & measuring tape.

Description:

Arrange all but two of the teams in circle subjects standing 1.50 mts apart facing in. Appoint one of the selected subjects 'Dogs' and the other 'Cats', and place them on opposite sides of the circle. At signal, 'Dogs' chases the 'Cat'. The 'Cat' may run between any of the open gaps between subjects, but as soon as he has, the gap becomes closed and he cannot thereafter run through closed gaps. To close a gap the two subjects standing adjacent to the gap through which the 'Cat' has run grasp hands at shoulder height. The 'Dogs' or the other hand can only run through closed gaps-he must duck under the raised hands.

Scoring: The game continues until the 'Cat' is caught and wins a point. Two new subjects are then appointed 'Dogs' and 'Cat', the old runner join the circle and at signal, the game continues.

4.7 LOAD DOWN SHUTTLE RELAY

Equipments: Volley balls, measuring tape & marking powder.

Description:

The group is divided into two halves, each half is placed in file opposite to the other half, with a distance of 10 metres between them. Small circles are drawn in front of the subjects of each half. Four balls are kept in the circle in front of No.1 subject. At a given signal, the No.1 subject picks up all four balls in the circle. He runs to the opposite side and places the balls in the circle in front of No.2 subject. The No.2 subject picks up the balls and runs to the opposite side and places the balls in the circle in front of No.3 subject. The game continues until all subjects are back in their original positions.

Scoring: The first group to gain its original position wins the relay. When a ball is dropped, the subject must stop and recover it.

4.8 DOUBLE CIRCLE FILL THE GAP

Equipments: Measuring tape & marking powder.

Description:

Arrange all but one of the team in a double circle, facing in subject of the inner circle standing 1 mt. apart subjects of the outer circle covering of the subjects of the inner circle at a distant of 1 mt. Appoint the extra subject 'It' and place him outside of the

outer circle. At signal, "It" runs about the outer circle and tags one of the subjects, and then, running in either direction, hurries about the outside circle. The subject tagged by "It" immediately steps forward and tags the player in front of him and then both start running about the circle the rear rank subjects to the right, the front rank subject to the left, both going between the ranks of the two circles. On meeting at the opposite side of the circle they pass on the right.

Scoring: Runners left without a place becomes "It", takes position on the outside of the circle wins a point and continues as did his predecessor.

4.9 HEADS AND TAILS

Equipments: Measuring tape & marking powder.

Description:

Establish two parallel lines 20 mts. apart. Divide the team into two groups of equal subjects and place them standing back to back one meter apart in the centre of the field parallel to the base lines. The line each group faces is that group's base line. Call one team "Heads" and the other "Tails". At signal, toss up a coin and call the side that shows up. Either side that is called runs for its base line, attempting to get there before any subject of the opposite team group can tag them.

Scoring: Any subject tagged by an opponent before he reaches his base line, one point is scored for his team. When all have crossed the base line or have been tagged and carried, all return to their, all return to their original positions and the coins tossed up again. In this manner the game continues. The group scoring the highest of points wins.

4.10 HUNTER AND HUNTED

Equipments: None

Description:

Arrange all but three of the team in a circle; subjects holding hands at shoulder height. The three subjects are numbered "One," "Two," "Three" respectively and placed equal distance apart outside of the circle. At signal, each attempting to tag the man he is after and at the same time avoids being tagged himself. Each subject, therefore, is both chasing someone. The runners may run in and out about the circle as they please, except that they must not go more than three and half mts. Beyond the outside of the

circle. The subjects in the circle are not allowed to interfere with the runners. The chase continues until one subject has been tagged; this subject is eliminated. The next three runners then step out of the circle and the three who have just finished take their places in the circle.

Scoring: The game continues in this manner until all have run. The winners are numbered off again and the winners decided. This continues until but one subject is left; this subject is the winner.

4.11 SEWING UP THE GAPS

Equipments: Marking powder.

Description:

All the subjects but two stand in a large circle, without joining hands. chaser is going to chase runner in a game of tag. Runner may run anywhere outside or inside the circle, provided that he does not stray too far from it. Every time runner runs between two of the subjects in the circle, these two must join hands and keep them joined. This is "sewing up the gaps". Runner is permitted to run between the gaps after they have been sewed up; the subject's part hands for him temporarily. But, is not allowed to break through the joined hands. Before beginning the chase, chaser counts to ten, giving runner a chance to sew up several gaps as a head start. runner may sew them up either in a continuous line or at several points around the circle. Then chaser runs in pursuit of runner.

Scoring: The point of the game is for him to catch him before he can sew up all the gaps. If he is able to do this, chaser wins. After the game has been played once, the two subjects reverse roles, and it is repeated. Several pairs of subjects should be given a chance to be active. This game is exciting and suspenseful.

4.12 SORE TOE RELAY

Equipments: Marking powder.

Description:

Delineate 2 parallel lines, approximately 10 yards (meters) apart. One line is the start and finish; the other is a turn-around line. Divide students into groups and line up groups, single file, behind the start line. At the start signal, the first subject from each group hops to the turn-around line on one foot, turns around, and hops on the other

foot back to the starting line. The subject has a sore right toe on the way there and a sore left toe on the way back. When the first subject crosses the finish line, the next subject goes. subjects must hold the "injured" foot with both hands when hopping.

Scoring: The first group to complete the race and be seated behind the finish line wins.

4.13 SQUARE RELAY

Equipments: Balls, chairs, measuring tape & marking powder.

Description:

The participants sit in chairs in four equal groups. Each group is on the side of a square, facing in, and should consist of between five and fifteen subjects. There is a small table or heavy chair or stand directly in the center of the square. The subject sitting in the extreme left seat of each line is given an object, possibly a rubber ball or beanbag. At a signal from the leader, he passes this object quickly to the right. Each subject must touch the object as it goes down the line. When it reaches the person in the end seat on the right, he rises, holding it, and runs forward, passing around the chair or table in the centre of the square. As he does this, each subject in his line rises and shifts one seat to the right. The first subject returns to the line. Sitting in the seat all the way to the left, this was vacated when the subjects moved one position to the right. He passes the object up the line again, and the subject who is now on the end seat on the right takes it and runs around the center stand. Beginning at the leader's signal, all teams carry on this action, to start the game. When all four lines are in action at once and with traffic jams occurring as the subjects is rife. In order to involve more subjects and have more activity going around the center stand, it is possible to have a hexagon or octagon, instead of a square, with six or eight subjects running continuously.

Scoring: The first group to have all of its subjects complete the action is the winner.

4.14 TOWER BALL

Equipments: Balls, measuring tape & marking powder.

Description:

Arrange the player in circle 10 mts. in diameter, facing in. Stand an Indian club in the centre of the circle this is the "Tower". Appoint one subject "Guard" and place him the

centre of the circle. Give one of the subjects in the circle a ball. At signal the subject with the ball throws it at the "Tower"; attempting to knock it over. The "Guard" attempts to prevent this. The subjects in the circle recover the ball after every throw and repeat their efforts; all throws, however, must be made from the circle.

Scoring: Any subject causing the "Tower" to fall either by hitting it directly or forcing the guard to knock it over becomes "Guard" and one point is scored for his group. The old "Guard" takes position in the circle, the new "Guard" sets up the "Tower" and the game continues.

4.15 TRIPLE CHASE

Equipments: Measuring tape & marking powder.

Description:

Establish a playing field 20 mts. square. Have the team count off by threes. Place the first team of three in the playing area, each standing in one corner of the area. At signal, No. 1 chases No. 2 number 2 chases No. 3 and No. 3 chases No. 1; each subject attempts himself.

Scoring: The subject who tags the one he is after first is winner. The second subject takes positions in corners and repeat. This continues until all have completed. The winners are again numbered off by threes and, each group in turn completes to decide the winner. The game is carried on in this manner until but one subject is left this subject is the winner.

4.16 POTATO RACE

Equipments: Potatoes, measuring tape & marking powder.

Description:

The team was divided into groups of equal number. Teams stand in files behind the starting line. Between the starting line and the finish line, equal number circles were drawn in front of each group. In each circle one potato is placed. On signal the first subject from each group runs forward, picks up the potato from the circle in front of his group, and places it to the finishing line one by one and runs back to touch the second subject of his group. The second subject runs, pick up the potato, places it in each circle one by one as originally placed and tags the third.

Scoring: The relay continues in the same manner. The group which finishes first wins.

4.17 BALL PASS AND RUN RELAY

Equipments: Volley balls, measuring tape & marking powder.

Description:

Arrange the groups in parallel lines 3.5 mts. apart, with the subjects in each line 1.5 mts. apart. Establish two distant turning points, one 3.5 mts. to the right of each line, and one 3.5 mts. to the left of each line. Give the subject at the right end of each group. At signal the subject with the ball passes it to the second subject, who passes it to the third, and so on down the line to the last subject; this subject, carrying the ball, runs to the left turning point and then back to the right turning point, running zig zag through the line of subjects, alternately going behind and in front of each successive subject. After touching or rounding the right turning point the runner passes the ball to the first man in the line, and the ball is immediately passed to the end of the line as before. The first runner, after passing the ball, drops in at the right end of the line. This continues, each subject carrying the ball forward until all have carried it. As each subject moving one place to the left.

Scoring: Each subject running with the ball must tag or round both turning points. The group finishing in its original position first, wins.

4.18 ZIG ZAG RELAY

Equipments: Indian clubs, measuring tape & marking powder.

Description:

Divide the subjects into two equal teams. Arrange the subjects in each team stand in a line a little behind the starting line. Put first Indian club at a distance of nearly 5 Meters from the first subject and the last Indian club likewise at the destination line. After hearing the sound of the whistle of the instructor the first subject from each team runs zig zag between the two Indian clubs and finally around the destination line and tags the second subject in his team and sits down last in his row. After that the second subject in the each team runs zig zag between the Indian club and finally around the destination line and tags the third, subject in his team and sits down last in his row.

Scoring: Likewise other subjects in his team repeat the same procedure and finish the round till the last subject in each team. Whichever team finishes first was declared the champion.

PILOT STUDY

The pilot study was conducted before finalizing recreational games training programme to assess the preliminary receptivity of the subjects to fix up the sub-maximal load of the workout session and also to see the feasibility of the administrative procedure with twelve subjects. They were divided into two groups (male and female) of six subjects each and both groups practiced for 8 weeks (3 alternative days in a week) under the careful supervision of experts and the investigator and prescribing the adequate load for the experimental groups. This was done by regular checking of the pulse rate during training session. After seeing their preliminary state and their age factor, it was finalized that a heart rate of 101 to 126 beats per min. was the optimum for a sub-maximal load. The selected Psycho-Neuro-Physiological variables were measured according to the guidelines framed and based on the procedure to be adopted. The pre, mid and post test were administered and the scores were recorded. The test procedures of dependent variables for the pretest were strictly followed in the mid and post test and the data was collected for the purpose of analysis. Though the results of the pilot study were not significant but still some improvement (increase and decrease) trends were observed in some of the variables. To get some effective and significant result, 16 week time duration was taken for this final study, where the progressive increase of the load was done by increasing the duration and intensity of the workout session by 10 minutes and 5% respectively after every fourth week. Based on the response of the subjects in the pilot study, it was ensured that at the preliminary stages, the intensity, number of repetitions, and duration of the activities included in the recreational games within the limits of the subject's capacity to produce the desired effects. This enabled the investigator to adapt suitable training schedule for both the groups undertaken in the study and the basic principles of sports training were followed.

EXPERIMENTAL DESIGN

To investigate the “**IMPACT OF RECREATIONAL GAMES ON PSYCHO-NEURO-PHYSIOLOGICAL VARIABLES OF ADULT TRIBALS**” on different phases of recreational games on Psycho-Neuro-Physiological variables on adult tribals for both sexes, the simple random sampling and single group repeated measure design was adopted in this study.



Figure-2: Study design with pre test, mid test and post test with test procedure and training phase.

STATISTICAL PROCEDURE

The data gathered were duly analyzed through statistical procedures. The different statistical procedures used in this study were as follows:

- ▲ To establish the reliability of Data, Pearson's product moment correlation was used.
- ▲ Repeated Measures Analysis of Variance was used to test the significant of mean difference over the progress of (pre-test, mid-test and post-test) recreational game on criterion measure; separately of two experimental groups [Group M (Male) and Group F (Female)].
- ▲ Further the Least significant difference post hoc test was used to find out the superiority of a phase over the others.

All the data were analyzed using Statistical Package for Social Sciences (SPSS Version 26).

LEVEL OF SIGNIFICANCE

For testing the difference among Pre Treatment phase, During Treatment Phase and Post Treatment Phase scores and also for comparing the means of two different groups [Group M (Male) and Group F (Female)] 0.05 level of significance was fixed to test the hypotheses.

CHAPTER

4

**ANALYSIS OF DATA AND
RESULTS OF THE STUDY**

Chapter IV

ANALYSIS OF DATA AND RESULTS OF THE STUDY

In this chapter, the analysis of data in Psycho-Neuro-Physiological variables of adult male and female tribals, age ranged from 50 to 55 years were examined by Repeated Measures Analysis of Variance (RMANOVA) in order to investigate the existence of significant differences on the training phases due to the impact of sixteen weeks of recreational games training.

In case of having significant differences on the training phases due to the Impact of sixteen weeks of recreational games training, Least significant difference (LSD) post hoc-test was applied in order to find out the existence of significant differences on the training phases due to the Impact of sixteen weeks of recreational games training. The level of significance was set at 0.05 level of confidence.

FINDINGS

PSYCHO-NEURO-PHYSIOLOGICAL VARIABLES

Descriptive statistics on Psycho-Neuro-Physiological variables of adult male tribals on different phases of training period due to the impact of sixteen weeks of recreational games training were presented in Table-5.

Table-5
Significance of differences of Means and Standard Deviations in Psycho-Neuro-Physiological variables of adult male tribals on different phases of training period due to the impact of sixteen weeks of recreational games training

Variables		Phases	Mean $\pm$ SD
Psychological	Self Esteem	Pre training	79.00 $\pm$ 5.54
		Mid training	79.15 $\pm$ 5.43
		After training	79.35 $\pm$ 5.25
	Life Satisfaction	Pre training	50.80 $\pm$ 4.53
		Mid training	51.00 $\pm$ 4.40
		After training	51.20 $\pm$ 4.37
	Locus of Control (Powerful others)	Pre training	13.90 $\pm$ 3.14
		Mid training	13.80 $\pm$ 3.00
		After training	13.60 $\pm$ 2.85
	Locus of Control (Chance control)	Pre training	30.20 $\pm$ 3.50
		Mid training	30.05 $\pm$ 3.61
		After training	29.90 $\pm$ 3.48
	Locus of Control (Individual control)	Pre training	30.75 $\pm$ 3.21
		Mid training	31.20 $\pm$ 3.00
		After training	31.25 $\pm$ 2.73
Neuropsychological	Self Efficacy	Pre training	76.80 $\pm$ 4.41
		Mid training	77.00 $\pm$ 4.27
		After training	77.30 $\pm$ 3.95
	Illusion	Pre training	6.11 $\pm$ 0.62
		Mid training	6.10 $\pm$ 0.60
		After training	6.09 $\pm$ 0.60
	Tactile Sense	Pre training	8.60 $\pm$ 0.50
		Mid training	8.55 $\pm$ 0.51
		After training	8.50 $\pm$ 0.51
	Hand Eye Co-ordination	Pre training	12.92 $\pm$ 0.60
		Mid training	12.91 $\pm$ 0.59
		After training	12.90 $\pm$ 0.58
	Gross movement of hands, finger and arms	Pre training	229.85 $\pm$ 3.94
		Mid training	229.70 $\pm$ 4.01
		After training	229.65 $\pm$ 3.98
	Depth Perception	Pre training	6.06 $\pm$ 0.98
		Mid training	6.04 $\pm$ 0.96
		After training	6.03 $\pm$ 0.94
	Reaction Time (Audio)	Pre training	1.22 $\pm$ 0.053
		Mid training	1.22 $\pm$ 0.052
		After training	1.21 $\pm$ 0.052
Physiological	Reaction Time (Visual)	Pre training	1.17 $\pm$ 0.050
		Mid training	1.17 $\pm$ 0.048
		After training	1.16 $\pm$ 0.049
	Resting Heart Rate	Pre training	80.40 $\pm$ 2.23
		Mid training	80.25 $\pm$ 1.92
		After training	80.05 $\pm$ 1.76
	Blood Pressure (Systolic)	Pre training	126.90 $\pm$ 2.00
		Mid training	126.80 $\pm$ 1.99
		After training	126.15 $\pm$ 2.48
	Blood Pressure (Diastolic)	Pre training	84.60 $\pm$ 2.82
		Mid training	84.25 $\pm$ 3.06
		After training	84.05 $\pm$ 3.03

TEST OF HOMOGENEITY

Mauchly's sphericity test is a statistical test used to validate a repeated measures analysis of variance (RMANOVA). The results are presented in the table 6.

Table-6
Mauchly's Test of Sphericity in Psycho-Neuro-Physiological
variables of adult male tribals

Within Subjects Effect		Mauchly's W	Approx. Chi-Square	df	Sig.
Psychological	Self Esteem	0.882	2.255	2	0.324
	Life Satisfaction	0.918	1.533	2	0.465
	Locus of Control (Powerful others)	0.794	4.153	2	0.125
	Locus of Control (Chance control)	0.874	2.422	2	0.298
	Locus of Control (Individual control)	0.798	4.069	2	0.131
	Self Efficacy	0.830	3.345	2	0.188
Neuropsychological	Illusion	0.789	4.268	2	0.118
	Tactile Sense	0.789	4.268	2	0.118
	Hand Eye Co-ordination	0.726	5.758	2	0.056
	Gross movement of hands, finger and arms	0.983	0.309	2	0.857
	Depth Perception	0.905	1.802	2	0.406
	Reaction Time (Audio)	0.734	5.576	2	0.062
	Reaction Time (Visual)	0.746	5.266	2	0.072
Physiological	Resting Heart Rate	0.799	4.043	2	0.132
	Blood Pressure (Systolic)	0.880	2.299	2	0.317
	Blood Pressure (Diastolic)	0.835	3.248	2	0.197

In the above table no. 6 (Mauchly's Test of Sphericity) the p-value or significance value of Self Esteem, Life Satisfaction, Locus of Control (Powerful others), Locus of Control (Chance control), Locus of Control (Individual control), Self Efficacy, Illusion, Tactile Sense, Hand Eye Coordination, Gross movement of hands, finger and

arms, Depth Perception, Reaction Time (Audio), Reaction Time (Visual), Resting Heart Rate, Blood Pressure (Systolic) and Blood Pressure (Diastolic) are 0.324, 0.465, 0.125, 0.298, 0.131, 0.188, 0.118, 0.118, 0.056, 0.857, 0.406, 0.062, 0.072, 0.132, 0.317 and 0.197 respectively which is greater than 0.05 ($P > 0.05$), so we fail to reject the null hypothesis as the variances of the differences between levels were not significantly different. Therefore, we could conclude that the distribution of the responses is the same (homogeneous) within group. In other words the assumption of sphericity has not been violated. If it would be violated then we would have to use Greenhouse-Geisser or Huynh-Feldt or Lower Bound for making and adjustment to the degrees of freedom of the repeated measures ANOVA.

The mean differences on Psycho-Neuro-Physiological variables of adult male tribals on three different phases of training period were compared through Repeated Measures Analysis of Variance (RMANOVA) statistics to find out the significance. The results of which are presented in Table-7.

Table-7
Repeated Measures Analysis of Variance of the means of
Psycho-Neuro-Physiological variables of adult male
tribals on different phases of training period due
to the impact of sixteen weeks of
recreational games training

Variables		Source of Variation	Sum of Squares	DF	Mean Squares	F-Value
Psychological	Self Esteem	Contrast	1.233	2	0.617	6.825*
		Error	3.433	38	0.090	
	Life Satisfaction	Contrast	1.600	2	0.800	8.143*
		Error	3.733	38	0.098	
	Locus of Control (Powerful others)	Contrast	0.933	2	0.467	5.783*
		Error	3.067	38	0.081	
	Locus of Control (Chance control)	Contrast	0.900	2	0.450	5.516*
		Error	3.100	38	0.082	
	Locus of Control (Individual control)	Contrast	3.033	2	1.517	6.428*
		Error	8.967	38	0.236	
	Self Efficacy	Contrast	2.533	2	1.267	5.918*
		Error	8.133	38	0.214	
Neuropsychological	Illusion	Contrast	0.004	2	0.002	1.54
		Error	0.05	38	0.0013	
	Tactile Sense	Contrast	0.100	2	0.050	1.54
		Error	1.23	38	0.0325	
	Hand Eye Co-ordination	Contrast	0.002	2	0.001	2.51
		Error	0.02	38	0.0005	
	Gross movement of hands, finger and arms	Contrast	0.433	2	0.217	2.83
		Error	2.900	38	0.076	
	Depth Perception	Contrast	0.006	2	0.003	1.99
		Error	0.060	38	0.002	
	Reaction Time (Audio)	Contrast	0.00005	2	0.00003	2.45
		Error	0.0004	38	0.00001	
	Reaction Time (Visual)	Contrast	0.000	2	0.0000	3.09
		Error	0.001	38	0.00002	
Physiological	Resting Heart Rate	Contrast	1.23	2	0.62	0.63
		Error	37.43	38	0.985	
	Blood Pressure (Systolic)	Contrast	6.633	2	3.317	1.98
		Error	63.367	38	1.668	
	Blood Pressure (Diastolic)	Contrast	3.10	2	1.55	1.99
		Error	29.57	38	0.778	

*Significant at 0.05 level of confidence

(Table values required for significance at 0.05 level with df 2 and 38 is 3.20)

The above Table-7 implied that the obtained 'F'- values were; 6.825 (Self Esteem), 8.143 (Life Satisfaction), 5.783 (Locus of Control-Powerful others), 5.516 (Locus of Control-Chance control), 6.428 (Locus of Control-Individual control) and 5.918 (Self Efficacy) which were greater than the table value 3.20 for degree of freedom 2 and 38 at 0.05 level of confidence. Hence it was inferred that the calculated 'F' values on the above mentioned Psycho-Neuro-Physiological variables were statistically significant. The findings of the study reveal that there was a significant difference exists on different phases of training period after applying Repeated Measures Analysis of Variance on Psycho-Neuro-Physiological variables of adult male tribals indicating a significant impact of Recreational games training.

Whereas the obtained 'F' values were: 1.54 (Illusion), 1.54 (Tactile Sense), 2.51 (Hand Eye Co-ordination), 2.83 (Gross movement of hands, finger and arms), 1.99 (Depth Perception), 2.45 (Reaction Time-Audio), 3.09 (Reaction Time-Visual), 0.63 (Resting Heart Rate), 1.98 (Blood Pressure-Systolic) and 1.99 (Blood Pressure-Diastolic) which were less than the significant level. The 'F' values observed on these above mentioned Psycho-Neuro-Physiological variables were not significant since it fails to reach the significant level, where by it was concluded that the difference among different phases of training period of these Psycho-Neuro-Physiological variables were statistically insignificant indicating a insignificant effect of training on these Psycho-Neuro-Physiological variables of adult male tribals.

Since significant differences were recorded on Psycho-Neuro-Physiological variables due to the impact of sixteen weeks of recreational games training on different phases of training period after applying Repeated Measures Analysis of Variance on adult male tribals, Least significant difference (LSD) post hoc-test was applied in order to find out the existence of significant differences in Psycho-Neuro-Physiological variables on different phases of training period due to the Impact of sixteen weeks of recreational games training and its result is presented in the Table-8.

Table-8
Paired adjusted final mean differences (Post hoc-test) in
Psycho-Neuro-Physiological variables of adult male
tribals on different phases of Training period due
to the Impact of sixteen weeks of
recreational games training

Variables	Pre training	Mid training	After training	Mean Difference	Critical Difference
Self Esteem	79.00	79.15		0.15	0.304
	79.00		79.35	0.35*	
		79.15	79.35	0.20	
Life Satisfaction	50.80	51.00		0.20	0.317
	50.80		51.20	0.40*	
		51.00	51.20	0.20	
Locus of Control (Powerful others)	13.90	13.80		0.10	0.287
	13.90		13.60	0.30*	
		13.80	13.60	0.20	
Locus of Control (Chance control)	30.20	30.05		0.15	0.289
	30.20		29.90	0.30*	
		30.05	29.90	0.15	
Locus of Control (Individual control)	30.75	31.20		0.45	0.492
	30.75		31.25	0.50*	
		31.20	31.25	0.05	
Self Efficacy	76.80	77.00		0.20	0.468
	76.80		77.30	0.50*	
		77.00	77.30	0.30	

**Significant at 0.05 level of confidence*

The multiple comparisons clearly showed in Table 8, there was significant differences in Self Esteem existed between, Pre training and After sixteen weeks training (MD = 0.35), as the Critical Difference required to be significant at 0.05 level was 0.304 and the obtained values were greater than the required value, it was understood from the result that the Self Esteem of the adult male tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) (MD = 0.15) and Mid training (after eight weeks) and After sixteen weeks training (MD = 0.20). Thus, Self Esteem was found to be significant at sixteen weeks of training.

Experimental Training Group (adult male tribals) showed significant improvement on Self Esteem through sixteen weeks of training. It elicited 0.44% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 8, there was significant differences in Life Satisfaction existed between, Pre training and After sixteen weeks training ($MD = 0.40$), as the Critical Difference required to be significant at 0.05 level was 0.317 and the obtained values were greater than the required value, it was understood from the result that the Life Satisfaction of the adult male tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) ($MD = 0.20$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.20$). Thus, Life Satisfaction was found to be significant at sixteen weeks of training.

Experimental Training Group (adult male tribals) showed significant improvement on Life Satisfaction through sixteen weeks of training. It elicited 0.79% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 8, there was significant differences in Locus of Control (Powerful others) existed between, Pre training and After sixteen weeks training ($MD = 0.30$), as the Critical Difference required to be significant at 0.05 level was 0.287 and the obtained values were greater than the required value, it was understood from the result that the Locus of Control (Powerful others) of the adult male tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) ($MD = 0.10$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.20$). Thus, Locus of Control (Powerful others) was found to be significant at sixteen weeks of training.

Experimental Training Group (adult male tribals) showed significant improvement on Locus of Control (Powerful others) through sixteen weeks of training. It elicited 2.16% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 8, there was significant differences in Locus of Control (Chance control) existed between, Pre training and After sixteen weeks training ($MD = 0.30$), as the Critical Difference required to be significant at

0.05 level was 0.289 and the obtained values were greater than the required value, it was understood from the result that the Locus of Control (Chance control) of the adult male tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences were found in Pre training and Mid training (after eight weeks) ($MD = 0.15$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.15$). Thus, Locus of Control (Chance control) was found to be significant at sixteen weeks of training.

Experimental Training Group (adult male tribals) showed significant improvement on Locus of Control (Chance control) through sixteen weeks of training. It elicited 0.99% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 8, there were significant differences in Locus of Control (Individual control) existed between, Pre training and After sixteen weeks training ($MD = 0.50$), as the Critical Difference required to be significant at 0.05 level was 0.492 and the obtained values were greater than the required value, it was understood from the result that the Locus of Control (Individual control) of the adult male tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences were found in Pre training and Mid training (after eight weeks) ($MD = 0.45$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.05$). Thus, Locus of Control (Individual control) was found to be significant at sixteen weeks of training.

Experimental Training Group (adult male tribals) showed significant improvement on Locus of Control (Individual control) through sixteen weeks of training. It elicited 1.63% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 8, there were significant differences in Self Efficacy existed between, Pre training and After sixteen weeks training ($MD = 0.50$), as the Critical Difference required to be significant at 0.05 level was 0.468 and the obtained values were greater than the required value, it was understood from the result that the Self Efficacy of the adult male tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences were found in Pre training and Mid training (after eight weeks) ($MD = 0.20$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.30$). Thus, Self Efficacy was found to be significant at sixteen weeks of training.

Experimental Training Group (adult male tribals) showed significant improvement on Self Efficacy through sixteen weeks of training. It elicited 0.65% of improvement after sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control-Chance control, Locus of Control-Individual control and Self Efficacy) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-3.

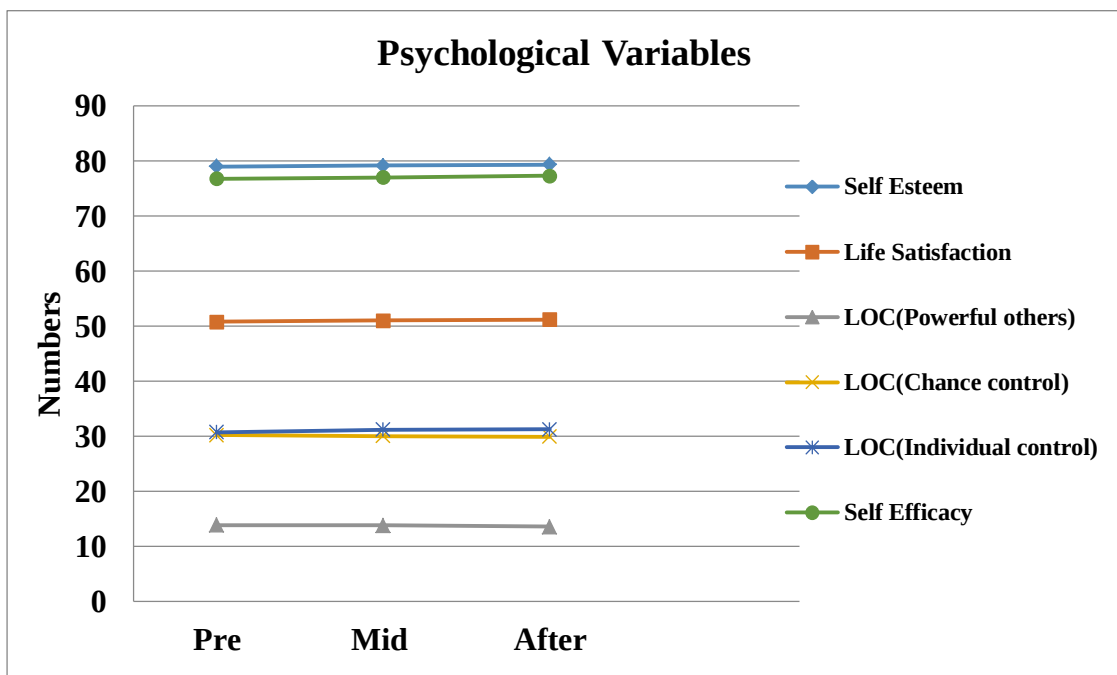


Fig.-03: Comparison of mean in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control-Chance control, Locus of Control-Individual control and Self Efficacy) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-03 implied that the mean scores in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control-Chance control, Locus of Control-Individual control and Self Efficacy) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 79.00, 79.15 and 79.35 and 50.80, 51.00 and 51.20 and 13.90, 13.80 and 13.60 and 30.20, 30.05 and 29.90 and 30.75, 31.20 and 31.25 and 76.80, 77.00 and 77.30 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control-Chance control, Locus of Control-Individual control and Self Efficacy) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Illusion) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-4.

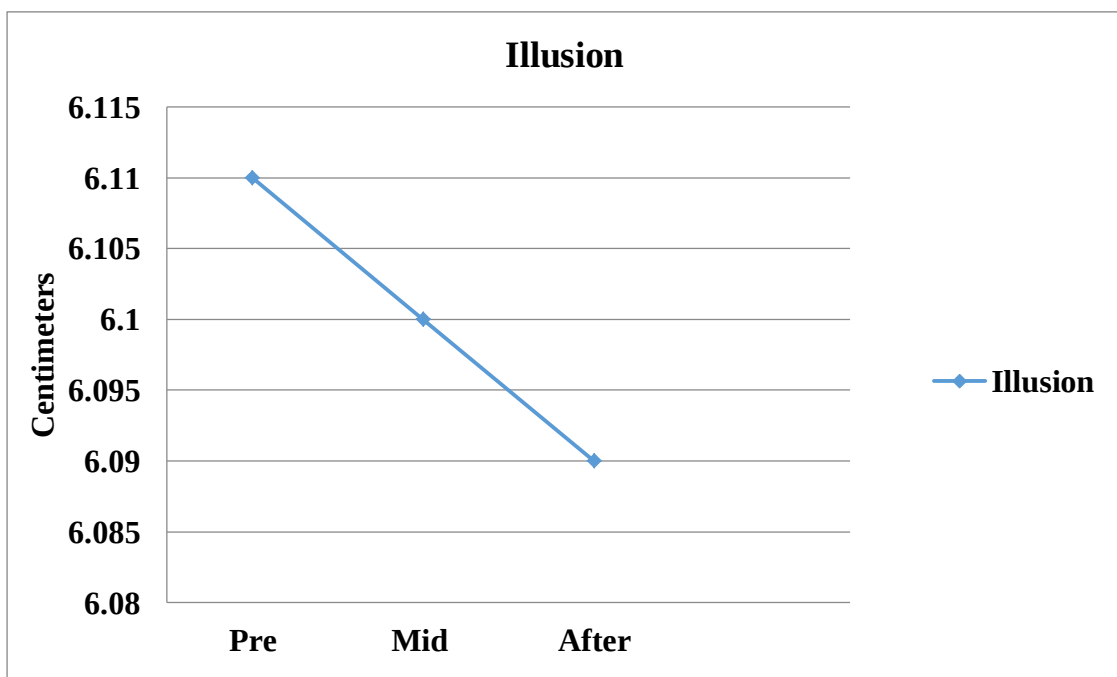


Fig.-04: Comparison of mean in Psycho-Neuro-Physiological variables (Illusion) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-04 implied that the mean scores in Psycho-Neuro-Physiological variables (Illusion) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 6.11, 6.10 and 6.09 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Illusion) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Tactile Sense) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-5.

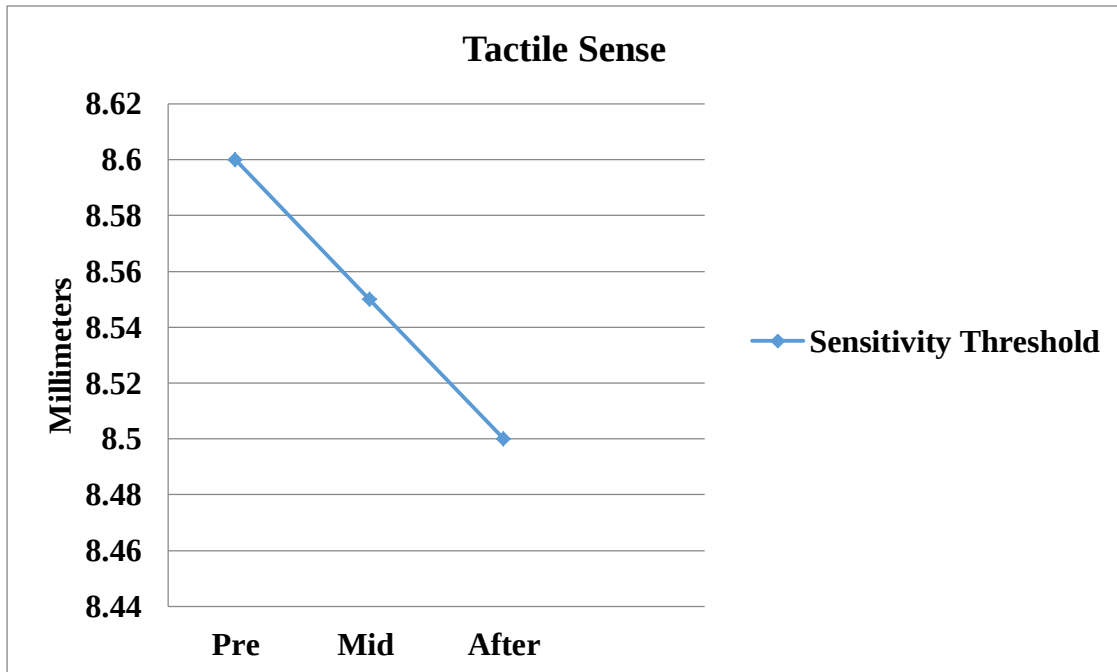


Fig.-05: Comparison of mean in Psycho-Neuro-Physiological variables (Tactile Sense) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-05 implied that the mean scores in Psycho-Neuro-Physiological variables (Tactile Sense) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 8.60, 8.55 and 8.50 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Tactile Sense) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-6.

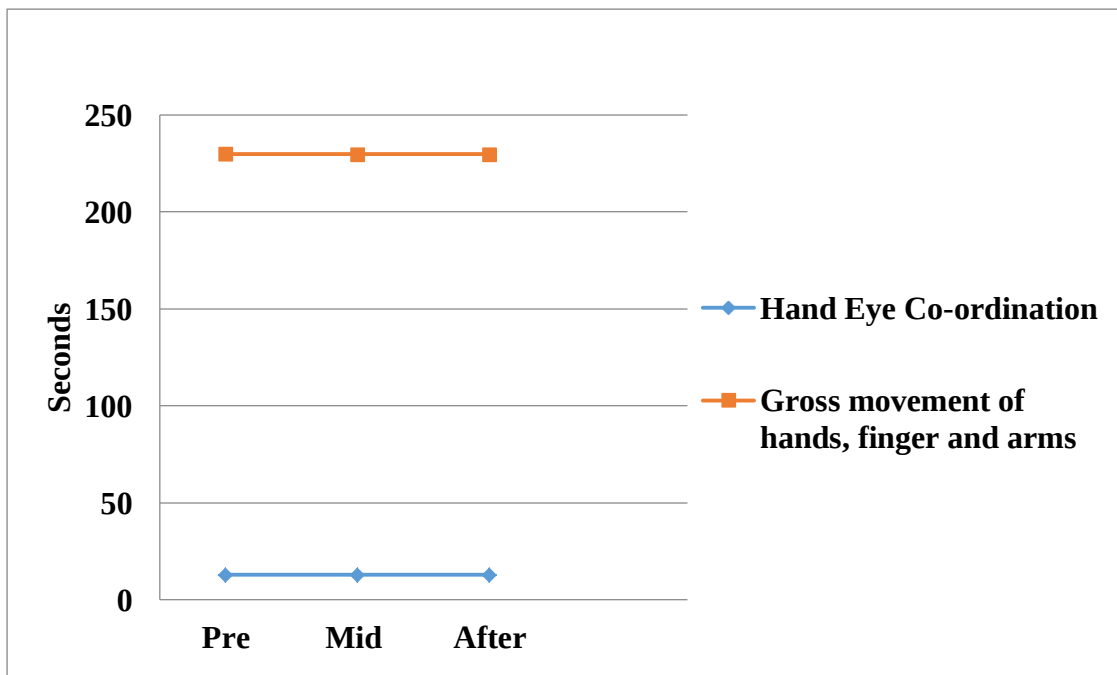


Fig.-06: Comparison of mean in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-06 implied that the mean scores in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 12.92, 12.91 and 12.90 and 229.85, 229.70 and 229.65 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Depth Perception) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-7.

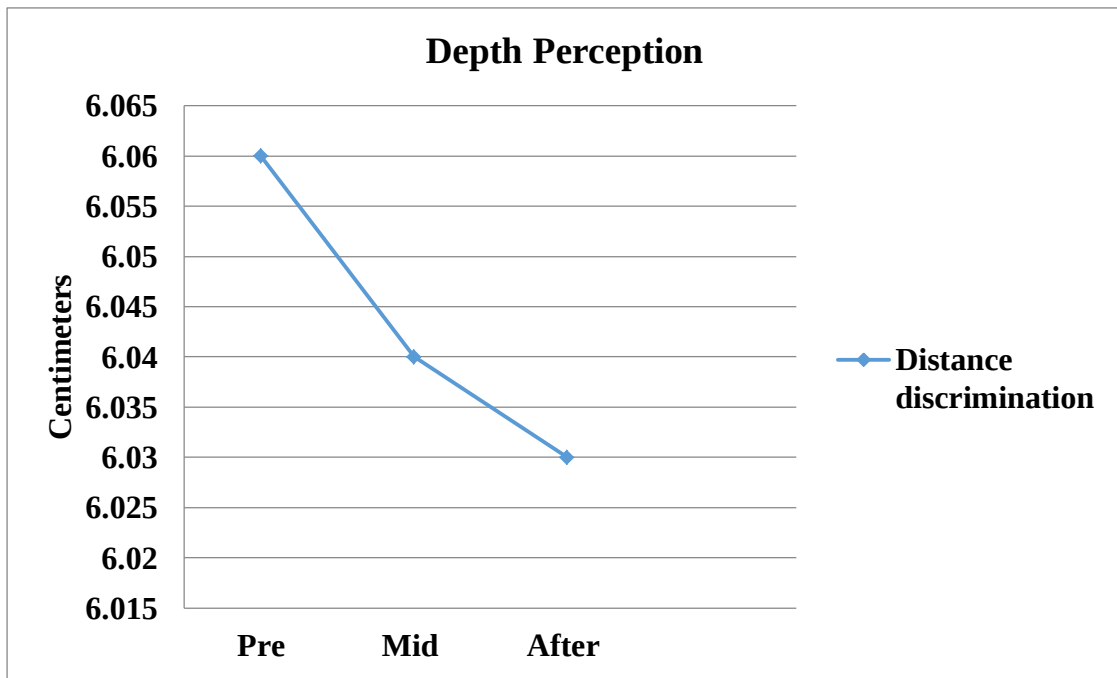


Fig.-07: Comparison of mean in Psycho-Neuro-Physiological variables (Depth Perception) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-07 implied that the mean scores in Psycho-Neuro-Physiological variables (Depth Perception) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 6.06, 6.04 and 6.03 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Depth Perception) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-8.

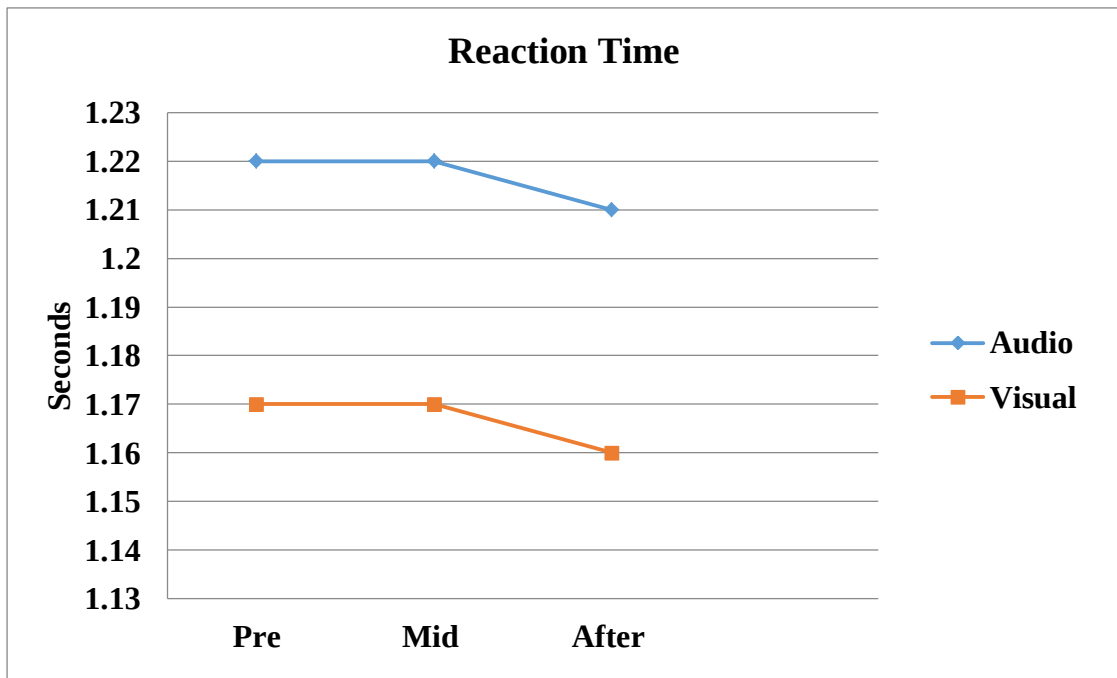


Fig.-08: Comparison of mean in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-08 implied that the mean scores in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 1.22 , 1.22 and 1.21 and 1.17, 1.17 and 1.16 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Resting heart rate) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-9.

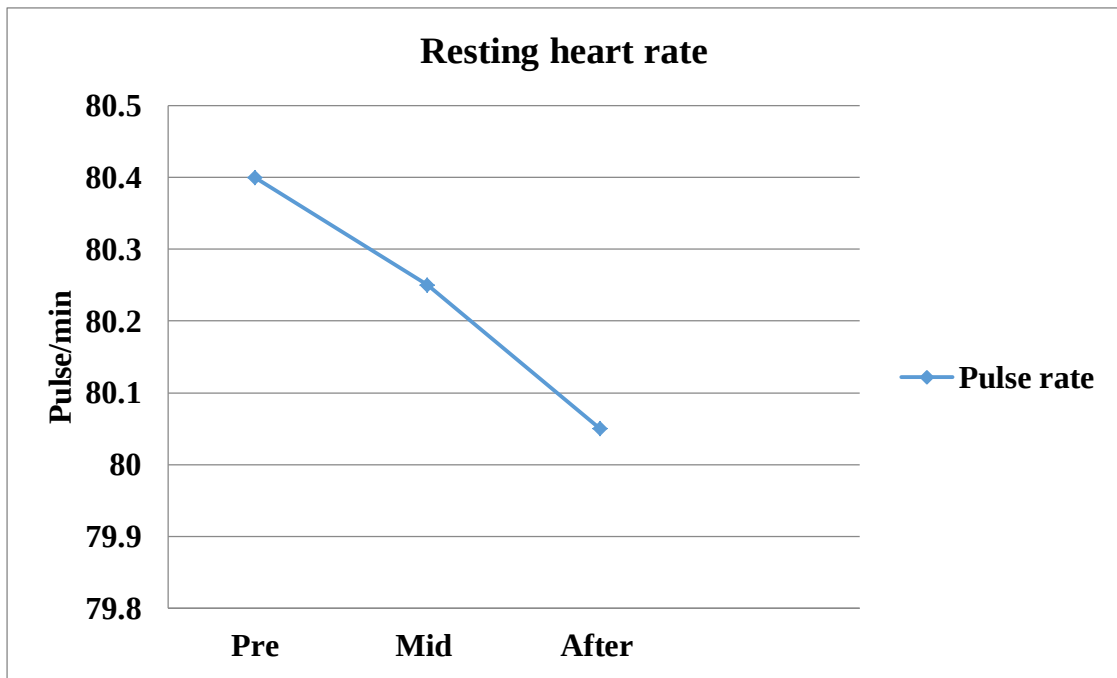


Fig.-09: Comparison of mean in Psycho-Neuro-Physiological variables (Resting heart rate) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-09 implied that the mean scores in Psycho-Neuro-Physiological variables (Resting heart rate) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 80.40 , 80.25 and 80.05 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Resting heart rate) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult male tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-10.

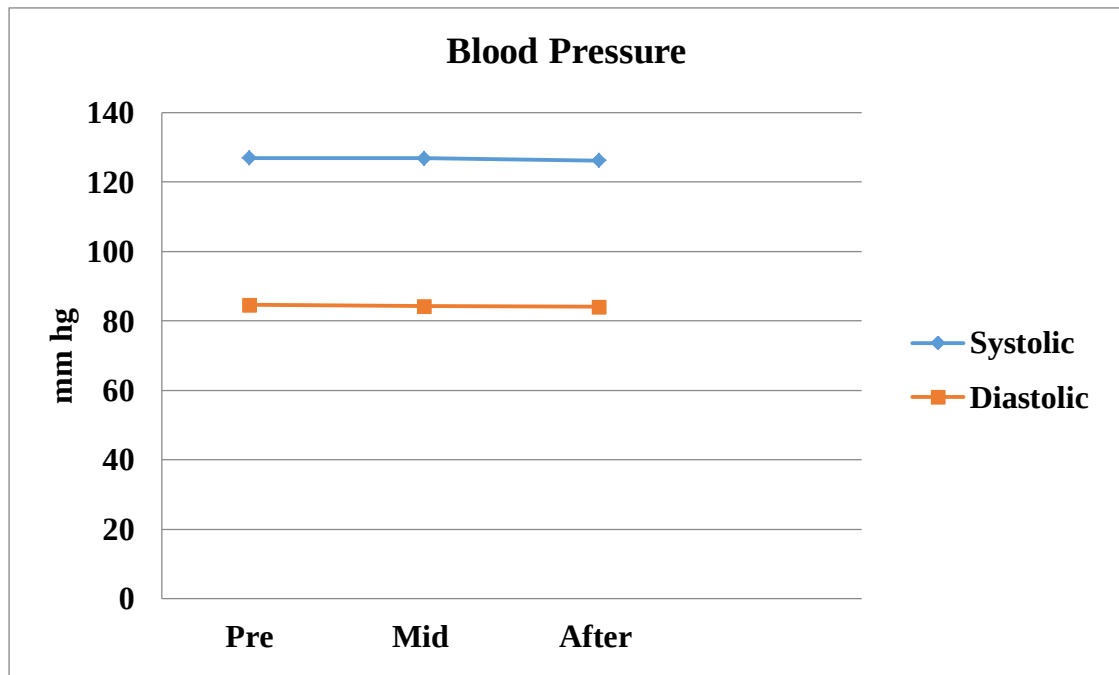


Fig.-10: Comparison of mean in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult male tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-10 implied that the mean scores in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult male tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 126.90, 126.80 and 126.15 and 84.60, 84.25 and 84.05 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult male tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

Descriptive statistics on Psycho-Neuro-Physiological variables of adult female tribals on different phases of training period due to the impact of sixteen weeks of recreational games training were presented in Table-9.

Table-9

Significance of differences of Means and Standard Deviations in Psycho-Neuro-Physiological variables of adult female tribals on different phases of training period due to the impact of sixteen weeks of recreational games training

Variables		Phases	Mean $\pm$ SD
Psychological	Self Esteem	Pre training	81.60 $\pm$ 4.92
		Mid training	81.70 $\pm$ 4.90
		After training	81.95 $\pm$ 4.98
	Life Satisfaction	Pre training	54.15 $\pm$ 3.63
		Mid training	54.35 $\pm$ 3.57
		After training	54.60 $\pm$ 3.53
	Locus of Control (Powerful others)	Pre training	15.05 $\pm$ 2.48
		Mid training	15.00 $\pm$ 2.29
		After training	14.65 $\pm$ 2.23
	Locus of Control (Chance control)	Pre training	31.40 $\pm$ 3.03
		Mid training	31.20 $\pm$ 3.19
		After training	30.95 $\pm$ 2.95
	Locus of Control (Individual control)	Pre training	32.75 $\pm$ 3.24
		Mid training	32.90 $\pm$ 3.19
		After training	33.20 $\pm$ 2.95
	Self Efficacy	Pre training	77.95 $\pm$ 4.58
		Mid training	78.20 $\pm$ 4.26
		After training	78.40 $\pm$ 4.21
Neuropsychological	Illusion	Pre training	6.14 $\pm$ 0.61
		Mid training	6.13 $\pm$ 0.60
		After training	6.12 $\pm$ 0.60
	Tactile Sense	Pre training	7.75 $\pm$ 0.44
		Mid training	7.70 $\pm$ 0.47
		After training	7.65 $\pm$ 0.49
	Hand Eye Co-ordination	Pre training	12.95 $\pm$ 0.53
		Mid training	12.94 $\pm$ 0.54
		After training	12.93 $\pm$ 0.53
	Gross movement of hands, finger and arms	Pre training	219.60 $\pm$ 4.12
		Mid training	219.40 $\pm$ 3.91
		After training	219.35 $\pm$ 3.95
	Depth Perception	Pre training	6.57 $\pm$ 0.58
		Mid training	6.57 $\pm$ 0.58
		After training	6.56 $\pm$ 0.57
	Reaction Time (Audio)	Pre training	1.35 $\pm$ 0.085
		Mid training	1.35 $\pm$ 0.085
		After training	1.34 $\pm$ 0.085
	Reaction Time (Visual)	Pre training	1.23 $\pm$ 0.055
		Mid training	1.23 $\pm$ 0.053
		After training	1.22 $\pm$ 0.055
Physiological	Resting Heart Rate	Pre training	78.95 $\pm$ 3.61
		Mid training	78.80 $\pm$ 2.98
		After training	78.60 $\pm$ 2.89
	Blood Pressure (Systolic)	Pre training	118.65 $\pm$ 2.72
		Mid training	118.55 $\pm$ 2.63
		After training	118.45 $\pm$ 2.44
	Blood Pressure (Diastolic)	Pre training	78.30 $\pm$ 2.92
		Mid training	78.20 $\pm$ 2.52
		After training	78.05 $\pm$ 2.56

TEST OF HOMOGENEITY

Mauchly's sphericity test is a statistical test used to validate a repeated measures analysis of variance (RMANOVA). The results are presented in the table 10.

Table-10
Mauchly's Test of Sphericity in Psycho-Neuro-Physiological
variables of adult female tribals

Within Subjects Effect		Mauchly's W	Approx. Chi-Square	df	Sig.
Psychological	Self Esteem	0.765	4.831	2	0.089
	Life Satisfaction	0.745	5.291	2	0.071
	Locus of Control (Powerful others)	0.810	3.797	2	0.150
	Locus of Control (Chance control)	0.876	2.388	2	0.303
	Locus of Control (Individual control)	0.730	5.659	2	0.059
	Self Efficacy	0.730	5.657	2	0.059
Neuropsychological	Illusion	0.726	5.758	2	0.056
	Tactile Sense	0.789	4.268	2	0.118
	Hand Eye Co-ordination	0.726	5.758	2	0.056
	Gross movement of hands, finger and arms	0.750	5.179	2	0.075
	Depth Perception	0.726	5.758	2	0.056
	Reaction Time (Audio)	0.726	5.758	2	0.056
	Reaction Time (Visual)	0.943	1.048	2	0.592
Physiological	Resting Heart Rate	0.798	4.067	2	0.131
	Blood Pressure (Systolic)	0.789	4.268	2	0.118
	Blood Pressure (Diastolic)	0.774	4.623	2	0.099

In the above table no. 10 (Mauchly's Test of Sphericity) the p-value or significance value of Self Esteem, Life Satisfaction, Locus of Control (Powerful others), Locus of Control (Chance control), Locus of Control (Individual control), Self Efficacy, Illusion, Tactile Sense, Hand Eye Coordination, Gross movement of hands, finger and arms, Depth Perception, Reaction Time (Audio), Reaction Time (Visual), Resting Heart Rate, Blood Pressure (Systolic) and Blood Pressure (Diastolic) are 0.089, 0.071,

0.150, 0.303, 0.059, 0.059, 0.056, 0.118, 0.056, 0.075, 0.056, 0.056, 0.592, 0.131, 0.118 and 0.099 respectively which is greater than 0.05 ($P > 0.05$), so we fail to reject the null hypothesis as the variances of the differences between levels were not significantly different. Therefore, we could conclude that the distribution of the responses is the same (homogeneous) within group. In other words the assumption of sphericity has not been violated. If it would be violated then we would have to use Greenhouse-Geisser or Huynh-Feldt or Lower Bound for making and adjustment to the degrees of freedom of the repeated measures ANOVA.

The mean differences on Psycho-Neuro-Physiological variables of adult female tribals on three different phases of training period were compared through Repeated Measure Analysis of Variance (RMANOVA) statistics to find out the significance. The results of which are presented in Table-11.

Table-11
Repeated Measures Analysis of Variance of the means of Psycho-Neuro-Physiological variables of adult female tribals on different phases of training period due to the impact of sixteen weeks of recreational games training

SI. No.	Variables	Source of Variation	Sum of Squares	DF	Mean Squares	F-Value
1	Self Esteem	Contrast	1.300	2	0.650	7.337*
		Error	3.367	38	0.089	
2	Life Satisfaction	Contrast	2.033	2	1.017	8.338*
		Error	4.633	38	0.122	
3	Locus of Control (Powerful others)	Contrast	1.900	2	0.950	7.573*
		Error	4.767	38	0.125	
4	Locus of Control (Chance control)	Contrast	2.033	2	1.017	5.824*
		Error	6.633	38	0.175	
5	Locus of Control (Individual control)	Contrast	2.100	2	1.050	7.624*
		Error	5.233	38	0.138	
6	Self Efficacy	Contrast	2.033	2	1.017	6.475*
		Error	5.967	38	0.157	
7	Illusion	Contrast	0.002	2	0.001	1.82
		Error	0.02	38	0.0006	
8	Tactile Sense	Contrast	0.100	2	0.050	1.541
		Error	1.233	38	0.032	
9	Hand Eye Co-ordination	Contrast	0.002	2	0.001	2.509
		Error	0.018	38	0.000	
10	Gross movement of hands, finger and arms	Contrast	0.700	2	0.350	2.509
		Error	5.300	38	0.139	
11	Depth Perception	Contrast	0.002	2	0.001	2.51
		Error	0.001	38	0.0004	
12	Reaction Time (Audio)	Contrast	0.00002	2	0.00001	2.51
		Error	0.0002	38	0.000005	
13	Reaction Time (Visual)	Contrast	0.00002	2	0.00001	1.43
		Error	0.0003	38	0.00001	
14	Resting Heart Rate	Contrast	1.23	2	0.62	0.56
		Error	42.10	38	1.108	
15	Blood Pressure (Systolic)	Contrast	0.400	2	0.200	1.541
		Error	4.933	38	0.130	
16	Blood Pressure (Diastolic)	Contrast	0.833	2	0.417	0.888
		Error	17.833	38	0.469	

*Significant at 0.05 level of confidence

(Table values required for significance at 0.05 level with df 2 and 38 is 3.20)

The above Table-11 implied that the obtained 'F'- values were; 7.337 (Self Esteem), 8.338 (Life Satisfaction), 7.573 (Locus of Control-Powerful others), 5.824 (Locus of Control-Chance control), 7.624 (Locus of Control-Individual control) and 6.475 (Self

Efficacy) which were greater than the table value 3.20 for degree of freedom 2 and 38 at 0.05 level of confidence. Hence it was inferred that the calculated 'F' values on the above mentioned Psycho-Neuro-Physiological variables were statistically significant. The findings of the study reveal that there was a significant difference exists on different phases of training period after applying Repeated Measures Analysis of Variance on Psycho-Neuro-Physiological variables of adult female tribals indicating a significant impact of Recreational games training.

Whereas the obtained 'F' values were: 1.82 (Illusion), 1.541 (Tactile Sense), 2.509 (Hand Eye Co-ordination), 2.509 (Gross movement of hands, finger and arms), 2.51 (Depth Perception), 2.51 (Reaction Time-Audio), 1.43 (Reaction Time-Visual), 0.56 (Resting Heart Rate), 1.541 (Blood Pressure-Systolic) and 0.888 (Blood Pressure-Diastolic) which were less than the significant level. The 'F' values observed on these above mentioned Psycho-Neuro-Physiological variables were not significant since it fails to reach the significant level, where by it was concluded that the difference among different phases of training period of these Psycho-Neuro-Physiological variables were statistically insignificant indicating a insignificant effect of training on these Psycho-Neuro-Physiological variables of adult female tribals.

Since significant differences were recorded on Psycho-Neuro-Physiological variables due to the impact of sixteen weeks of recreational games training on different phases of training period after applying Repeated Measures Analysis of Variance on adult female tribals, Least significant difference (LSD) post hoc-test was applied in order to find out the existence of significant differences in Psycho-Neuro-Physiological variables on different phases of training period due to the Impact of sixteen weeks of recreational games training and its result is presented in the Table-12.

Table-12
Paired adjusted final mean differences (Post hoc-test) in
Psycho-Neuro-Physiological variables of adult female
tribals on different phases of Training period due
to the Impact of sixteen weeks of
recreational games training

Variables	Pre training	Mid training	After training	Mean Difference	Critical Difference
Self Esteem	81.60	81.70		0.10	0.30
	81.60		81.95	0.35*	
		81.70	81.95	0.25	
Life Satisfaction	54.15	54.35		0.20	0.353
	54.15		54.60	0.45*	
		54.35	54.60	0.25	
Locus of Control (Powerful others)	15.05	15.00		0.05	0.358
	15.05		14.65	0.40*	
		15.00	14.65	0.35	
Locus of Control (Chance control)	31.40	31.20		0.20	0.423
	31.40		30.95	0.45*	
		31.20	30.95	0.25	
Locus of Control (Individual control)	32.75	32.90		0.15	0.376
	32.75		33.20	0.45*	
		32.90	33.20	0.30	
Self Efficacy	77.95	78.20		0.25	0.401
	77.95		78.40	0.45*	
		78.20	78.40	0.20	

**Significant at 0.05 level of confidence*

The multiple comparisons clearly showed in Table 12, there was significant differences in Self Esteem existed between, Pre training and After sixteen weeks training (MD = 0.35), as the Critical Difference required to be significant at 0.05 level was 0.30 and the obtained values were greater than the required value, it was understood from the result that the Self Esteem of the adult female tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) (MD = 0.10) and Mid training (after eight weeks) and After sixteen weeks training (MD = 0.25). Thus, Self Esteem was found to be significant at sixteen weeks of training.

Experimental Training Group (adult female tribals) showed significant improvement on Self Esteem through sixteen weeks of training. It elicited 0.43% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 12, there was significant differences in Life Satisfaction existed between, Pre training and After sixteen weeks training ($MD = 0.45$), as the Critical Difference required to be significant at 0.05 level was 0.35 and the obtained values were greater than the required value, it was understood from the result that the Life Satisfaction of the adult female tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) ($MD = 0.20$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.25$). Thus, Life Satisfaction was found to be significant at sixteen weeks of training.

Experimental Training Group (adult female tribals) showed significant improvement on Life Satisfaction through sixteen weeks of training. It elicited 0.83% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 12, there was significant differences in Locus of Control (Powerful others) existed between, Pre training and After sixteen weeks training ($MD = 0.40$), as the Critical Difference required to be significant at 0.05 level was 0.358 and the obtained values were greater than the required value, it was understood from the result that the Locus of Control (Powerful others) of the adult female tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) ($MD = 0.05$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.35$). Thus, Locus of Control (Powerful others) was found to be significant at sixteen weeks of training.

Experimental Training Group (adult female tribals) showed significant improvement on Locus of Control (Powerful others) through sixteen weeks of training. It elicited 2.66% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 12, there was significant differences in Locus of Control (Chance control) existed between, Pre training and After sixteen weeks training ($MD = 0.45$), as the Critical Difference required to be significant at 0.05 level was 0.423 and the obtained values were greater than the required value, it was understood from the result that the Locus of Control (Chance

control) of the adult female tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) ($MD = 0.20$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.25$). Thus, Locus of Control (Chance control) was found to be significant at sixteen weeks of training.

Experimental Training Group (adult female tribals) showed significant improvement on Locus of Control (Chance control) through sixteen weeks of training. It elicited 1.43% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 12, there was significant differences in Locus of Control (Individual control) existed between, Pre training and After sixteen weeks training ($MD = 0.45$), as the Critical Difference required to be significant at 0.05 level was 0.376 and the obtained values were greater than the required value, it was understood from the result that the Locus of Control (Individual control) of the adult female tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) ($MD = 0.15$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.30$). Thus, Locus of Control (Individual control) was found to be significant at sixteen weeks of training.

Experimental Training Group (adult female tribals) showed significant improvement on Locus of Control (Individual control) through sixteen weeks of training. It elicited 1.37% of improvement after sixteen weeks of recreational games training.

The multiple comparisons clearly showed in Table 12, there was significant differences in Self Efficacy existed between, Pre training and After sixteen weeks training ($MD = 0.45$), as the Critical Difference required to be significant at 0.05 level was 0.401 and the obtained values were greater than the required value, it was understood from the result that the Self Efficacy of the adult female tribals has improved after sixteen weeks of different recreational games practice training. But no significant differences was found in Pre training and Mid training (after eight weeks) ($MD = 0.25$) and Mid training (after eight weeks) and After sixteen weeks training ($MD = 0.20$). Thus, Self Efficacy was found to be significant at sixteen weeks of training.

Experimental Training Group (adult female tribals) showed significant improvement on Self Efficacy through sixteen weeks of training. It elicited 0.58% of improvement after sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control- Chance control, Locus of Control-Individual control and Self Efficacy) of adult female tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-11.

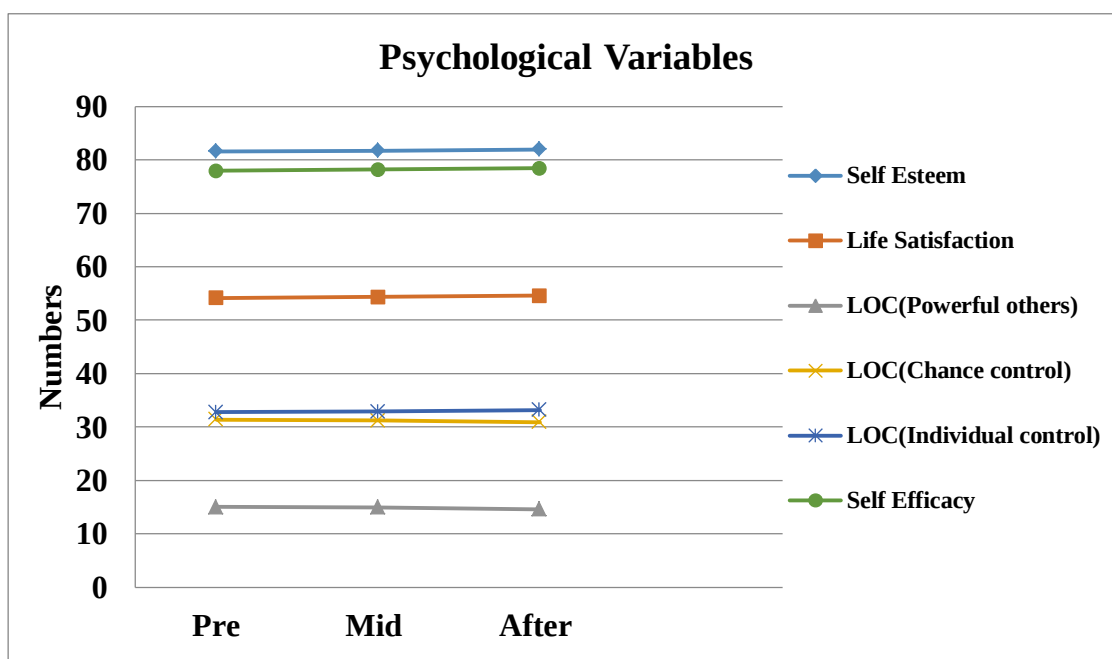


Fig.-11: Comparison of mean in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control- Chance control, Locus of Control-Individual control and Self Efficacy) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-11 implied that the mean scores in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control- Chance control, Locus of Control-Individual control and Self Efficacy) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 81.60, 81.70 and 81.95 and 54.15, 54.35 and 54.60 and 15.05, 15.00 and 14.65 and 31.40, 31.20 and 30.95 and 32.75, 32.90 and 33.20 and 77.95, 78.20 and 78.40 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Self Esteem, Life Satisfaction, Locus of Control-Powerful others, Locus of Control-Chance control, Locus of Control-Individual control and Self Efficacy) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Illusion) of adult female tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-12.

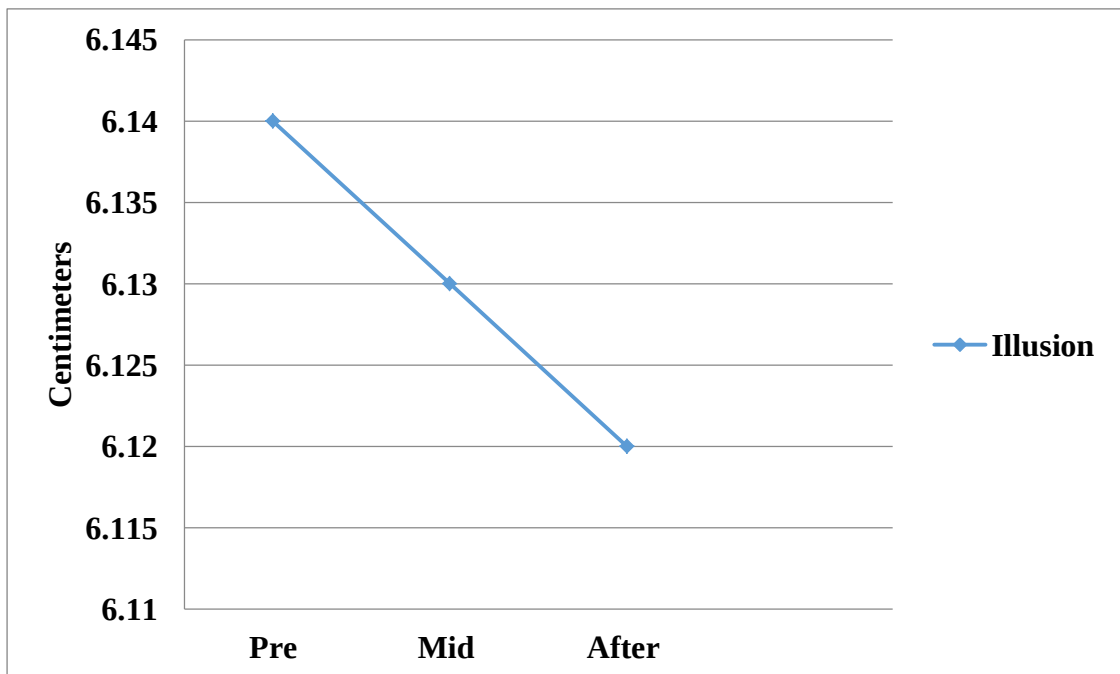


Fig.-12: Comparison of mean in Psycho-Neuro-Physiological variables (Illusion) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-12 implied that the mean scores in Psycho-Neuro-Physiological variables (Illusion) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 6.14, 6.13 and 6.12 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Illusion) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Tactile Sense) of adult female tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-13.

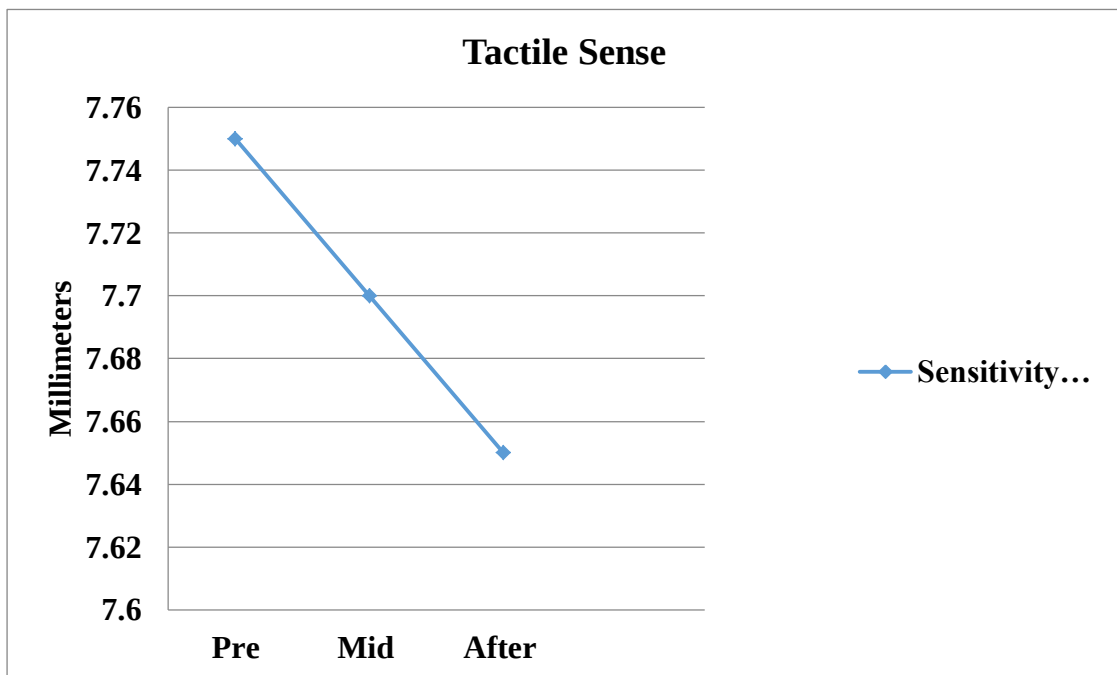


Fig.-13: Comparison of mean in Psycho-Neuro-Physiological variables (Tactile Sense) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-13 implied that the mean scores in Psycho-Neuro-Physiological variables (Tactile Sense) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 7.75, 7.70 and 7.65 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Tactile Sense) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult female tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-14.

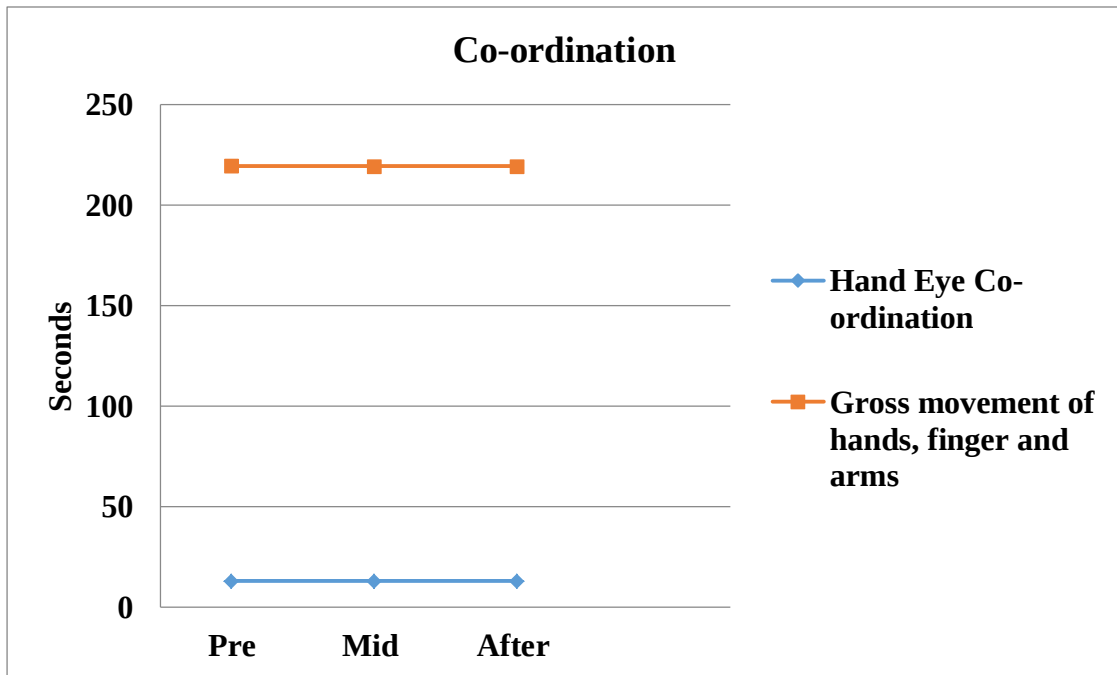


Fig.-14: Comparison of mean in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-14 implied that the mean scores in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 12.95, 12.94 and 12.93 and 219.60, 219.40 and 219.35 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Hand Eye Co-ordination and Gross movement of hands, finger and arms) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Depth Perception) of adult female tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-15.

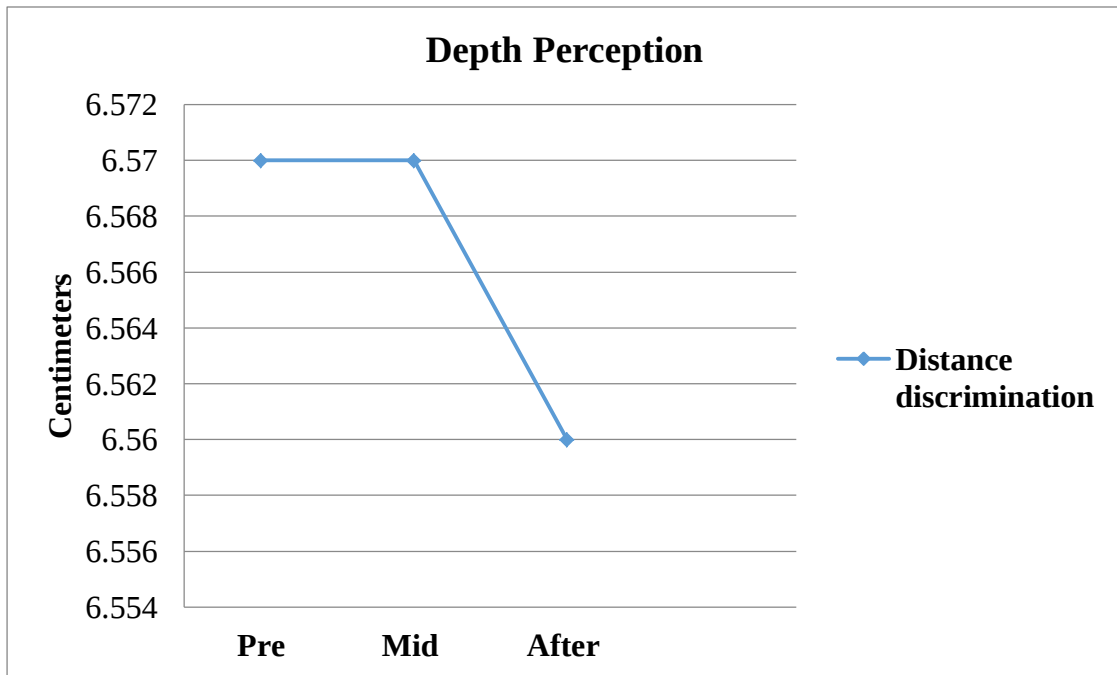


Fig.-15: Comparison of mean in Psycho-Neuro-Physiological variables (Depth Perception) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-15 implied that the mean scores in Psycho-Neuro-Physiological variables (Depth Perception) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 6.57, 6.57 and 6.56 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Depth Perception) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult female tribals (training group) in respect of time i.e. Pre training,

Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-16.

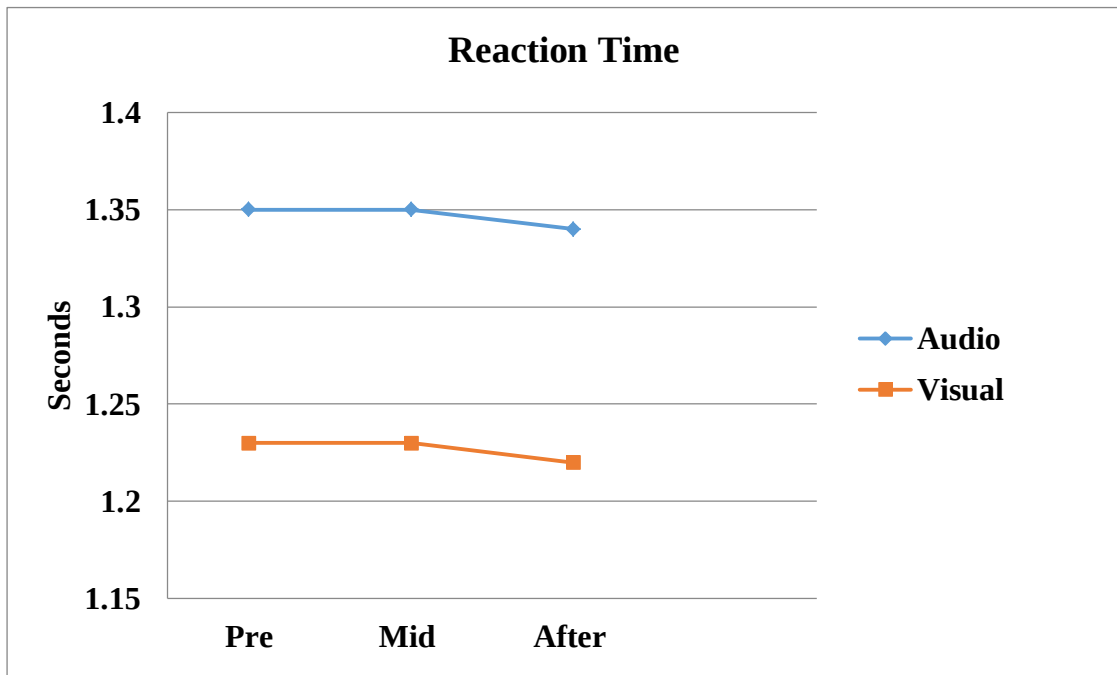


Fig.-16: Comparison of mean in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-16 implied that the mean scores in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 1.35, 1.35 and 1.34 and 1.23, 1.23 and 1.22 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Reaction Time Audio and Visual) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Resting heart rate) of adult female tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-17.

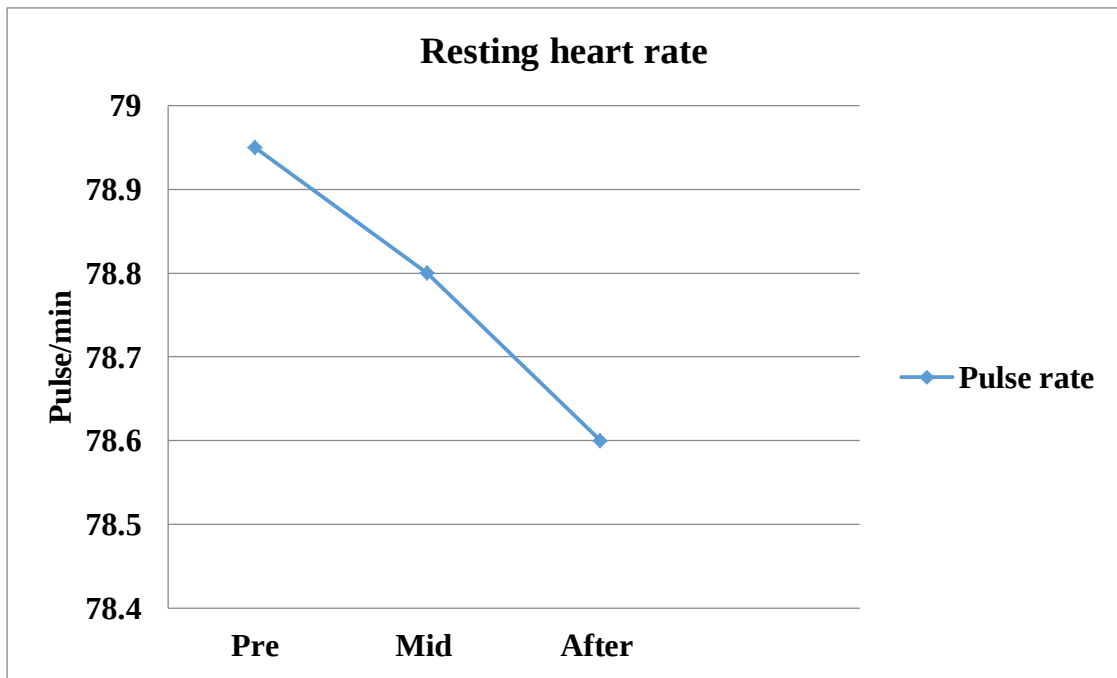


Fig.-17: Comparison of mean in Psycho-Neuro-Physiological variables (Resting heart rate) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-17 implied that the mean scores in Psycho-Neuro-Physiological variables (Resting heart rate) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 78.95, 78.80 and 78.60 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Resting heart rate) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

The changes in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult female tribals (training group) in respect of time i.e. Pre training, Mid training and After training means respectively were presented through line graph for better understanding of the results in Figure-18.

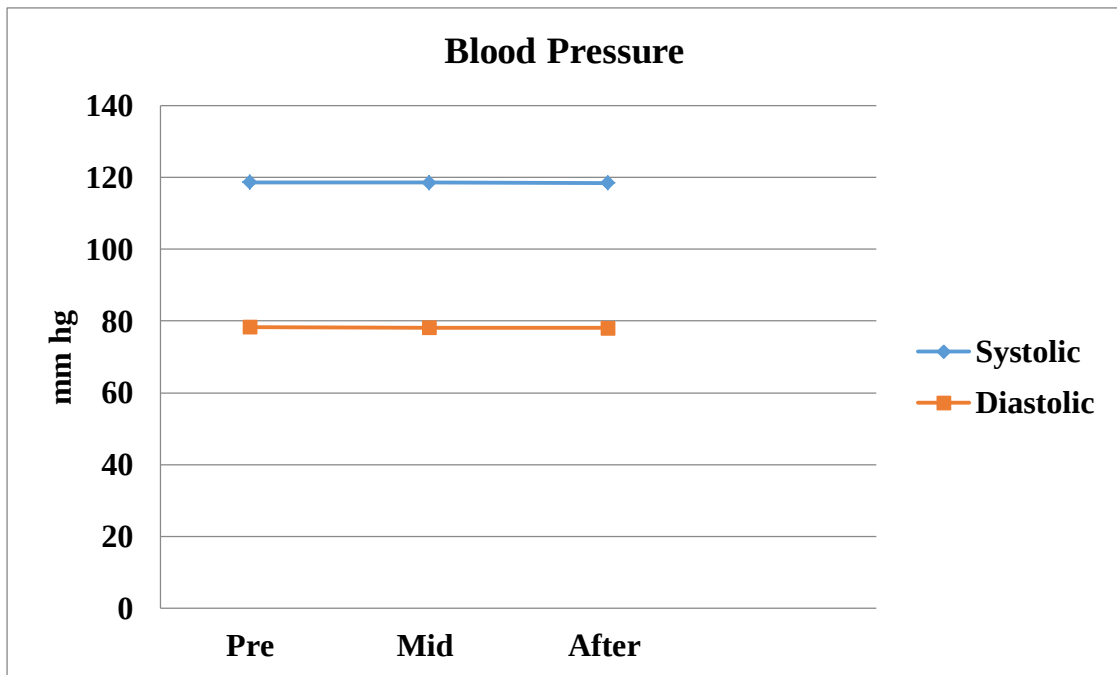


Fig.-18: Comparison of mean in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult female tribals on different phases of Training period due to the Impact of sixteen weeks of recreational games training.

The above Figure-18 implied that the mean scores in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult female tribals in Pre training, Mid training and After training due to the impact of sixteen weeks of recreational games training were 118.65, 118.55 and 118.45 and 78.30, 78.20 and 78.05 respectively.

This showed that there were differences of mean scores in Psycho-Neuro-Physiological variables (Blood Pressure Systolic and Diastolic) of adult female tribals on three different phases of training period due to the Impact of sixteen weeks of recreational games training.

DISCUSSION OF FINDINGS

SELF ESTEEM

The obtained mean difference between Pre and after training phases (end of sixteen weeks) was higher than the critical value at 0.05 level in the Self Esteem ($0.35 > 0.30$) of both male and female experimental group respectively. It revealed that the recreational games had produced significant impact in the variable Self Esteem after the sixteen weeks of training. It is inferred from the results of the study that recreational games had produced significant improvement (increase) on Self Esteem with respect of time which may be due to the recreational games training consisting different types of games.

The above Tables clearly indicates that the mean values of both experimental groups in Pre phase and Mid phase were almost equal and hence no significant difference in Pre phase and Mid phase were observed. However, significant differences were observed in Pre phase and after phase training (end of sixteen weeks).

After analyzing the results, the researcher found that there were significant differences among the different phases of training and there was a significant improvement (increase) on the both experimental groups in Self Esteem. The experimental groups has significantly increase the Self Esteem from the base line to after training. The present study demonstrated significant improvement in Self Esteem of 0.44% and 0.43% for male and female adult tribal after recreational games training (end of sixteen weeks) respectively. However the recreational games training produced greater impact to increase the level of Self Esteem in adult tribals.

On the basis of the result obtained it was concluded that recreational games training significantly improved self esteem of Adult tribals. The studies conducted by McAuley et al. (1997), Fox (1999) and Rendi et al. (2008) resulted in a similar finding.

In the study, subjects would have improved their self esteem by improving their group dynamics through enjoying the sixteen weeks recreational games training programme. This improvement could be attributed to the fact that the attendance level of participants to recreational games was high because varieties of games are more enjoyable with very ambience and the organized approach which have anointed the

general way by which they looked upon to themselves and that recreational activities decrease social phobia and promote the self-esteem level (Karagun et al., 2010).

The present results confirm the previous findings that self-esteem can be acquired with different physical activity interventions, such as a walking intervention or a Tai Chi intervention (Alfermann and Stoll, 2000; Li et al., 2002; McAuley et al., 2000).

From such findings it may be assumed that although the recreational games training in adult tribals were having some positive effect on the development of self esteem; however the impact of the Recreational games training was found to be effective in improving Self Esteem.

LIFE SATISFACTION

During the initial period of training Life Satisfaction improved significantly, at the initial to the mid test to after test intervention no significant increase of Life Satisfaction had noticed but from base level to the after test level an increase was noticed that may be due to the social existence of the persons spread and his activity level is high in the social environment circumstance.

The present study demonstrated significant improvement in Life Satisfaction of 0.79% and 0.83% for male and female adult tribal after recreational games training (end of sixteen weeks) respectively. However the recreational games training produced greater impact to increase the level of Life Satisfaction in adult tribals.

Rejeski and Mihalko (2001) stated that physical exercise improves a variety of variables concerning with health-related quality of life. Subjective outcomes, such as life satisfaction, are profoundly influenced by social cognitive factors, which determined by, in some way, on the social environmental circumstance of physical activity (Turner et al., 2004).

Furthermore, among other factors, the fellowship provided by a social system of a group-based exercise class has been related consistently to enhanced life satisfaction (Daig et al., 2009). Following these lines of thought, it is believable that perhaps the social environment circumstance created in the recreational games intervention, i.e., the fellowship from a social network, may explain the improvement of the subjective

outcomes, such as life satisfaction. Vilhjalmsson and Thorlindsson (1992) demonstrated life satisfaction to be positively connected to strenuous exercise, involvement in club and group sport.

The results support earlier findings showing enhanced life satisfaction for persons engaged in sports or after four weeks of adapted physical activity (Tasiemski et al., 2005; Blaasvaer et al., 1999).

LOCUS OF CONTROL

After analyzing the results, the researcher found that there were significant differences among the different phases of training and there was a significant improvement on both of the experimental groups in Locus of control.

The Locus of control scale is designed to measure dimension of individual (believe) variation such as Powerful others, Chance control and Individual control. The results of the study indicated that significant improvement in Locus of control-Powerful others (decrease), Locus of control-Chance control (decrease) and Locus of control-Individual control (increase) on the both experimental groups through sixteen weeks recreational games training. The present study demonstrated significant improvement in Locus of control (Powerful others), Locus of control (Chance control) and Locus of control (Individual control) of 2.16% and 2.66% ; 0.99% and 1.43% and 1.63% and 1.37% for male and female adult tribal after recreational games training (end of sixteen weeks) respectively. However the recreational games training produced greater impact to increase the level of Locus of control in adult tribals.

Participating in leisure activities is indeed positively connected to life satisfaction (e.g Kelly et al., 1987; Ragheb and Griffith, 1982; Riddick and Daniel, 1984). Adult are unlikely to be involve in recreational games because they expect it will benefit their health, but rather because of the positive emotions connected with helping others and the feeling of having a intent in life. Feeling in control of one's health should therefore have little effect on participation in such an activity.

People are unlikely to take part in leisure activities, for health reasons but preferably would do so for the broad enjoyment and positive feelings these activities evoke. Menec and Chipperfield (1997), Suggest that by improve adults' sense of control, their exercise behaviour and activity level in general may increase, thereby enhancing health and life satisfaction.

SELF EFFICACY

Participating in recreational games training both the experimental groups significantly improved (increased) their Self Efficacy level. Since all the mean scores of Self Efficacy level (Pre, mid and after training) were not equal. Repeated measures analysis of variance was computed (table 7 & 8) to find the significant difference among the different time point of both experimental groups. It was observed from the table that the F value was significant at 0.05 level. Post Hoc test (table 11 & 12) was done to find out the significant effect after participating in the recreational games training in the both groups.

The present study demonstrated significant improvement in Self Efficacy of 0.65% and 0.58% for male and female adult tribal after recreational games training (end of sixteen weeks) respectively. So treatment had positive effect on the groups belonging to adult tribals.

Although the physiological and psychological benefits of physical activity are well-documented (Bouchard et al., 1990). In much the same way as we know very little about the mechanisms by which exercise and physical activity determinant other psychosocial outcomes (McAuley, 1994; McAuley and Rudolph, 1995). Since exercise can be used to conserve personal relationships and improve feelings of social relation (Bengtson et al., 2009; Lindsay-Smith et al., 2018), it is likely that group-based exercise can effectively improve the ability to feelings of personal efficacy (McAuley et al., 1991). Moreover, exercise programmes in a group environment can provide a cost-effective form of social involvement, encourage positive affective states and further improve self-efficacy beliefs (McAuley et al., 2000).Therefore, recreational games could build social support through exercise may be implemented in adult tribals in their daily life.

The above findings add support to research that has found that self-efficacy is a key element in predicting exercise behavior and that self-efficacy is positively influenced by exercise for adult people (Netz et al., 2005; McAuley and Katula, 1998; McAuley and Rudolf, 1995).

ILLUSION

The results presented in table 7 & 8 showed that the both experimental groups male and female were 1.54 and 1.82 respectively. It was found that obtained F value on Illusion was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value of 3.20.

In the present study the results have elicited no changes in the Illusion of both experimental groups due to recreational games training. The Illusion level of the adult tribals were tend to reduce but statistically significant difference was not elicited. A number of studies have shown that influence in illusory effects (Coren and Girgus 1972_a, 1972_b, 1974; Dewar, 1968; Girgus et al., 1975; Gregory and Harris, 1975; Porac et al., 1979). However, the duration of the training and training intensity was not sufficient enough to bring preferable changes in Illusion.

The aging process is accompanied by a progressive decline in many aspects of perceptual function. Perhaps the most pertinent examples of sensory decline are found in vision and audition, where visual acuity and auditory sensitivity decrement in an age-dependent manner (Pitts, 1982; Liu and Yan, 2007). The results of the present study do not agree with the findings of Du Toit et al. (2012) reported that physical exercise positively influence on visual proficiency.

TACTILE SENSE

The results of the study indicate that statistically there was no significant difference in the level of tactile sensitivity after a sixteen weeks recreational games training at 0.05 level of confidence, yet no significant improvement occurs in case of tactile sense to draw an assertive conclusion because the improvement was not there and this happens due to the short term duration of period. The results conclude that if the recreational games training continuous for long term duration of period (such as 6 months, 9

months etc.) then there may be a significant effect in the level of tactile sense of adults (Wickremaratchi and Llewelyn, 2006).

Decorps et al. (2014) investigated that with advancing age, a decrement in the main sensory modalities including touch sensation and perception is well reported to develop. Thus the results are in agreement with present study.

HAND EYE CO-ORDINATION

Good coordination can change and move rapidly from one pattern of motion to another so that the movement becomes impressive. Coordination involves the role of the eyes, hands and feet that are moved simultaneously. Coordination is an integrated movement between hands, eyes and feet at the same period (Hermansyah et al., 2017). Hand eye coordination associate a number of sensorimotor systems such as cognitive features including visual system, vestibular system, proprioception, eye-head-arm and control systems as well as attention and memory (Crawford et al. 2004).

The results of the study indicate that statistically there was no significant difference in the Hand Eye Co-ordination after a sixteen weeks recreational games training at 0.05 level of confidence, yet no improvement occurs in case of Hand Eye Co-ordination to draw an assertive conclusion because the results also suggest that hand-eye coordination is sensitive to the short period effects of exercise, mediated by various factors (Tomprowski and Ellis, 1986), such as physical fitness of subjects, intensity and duration of the exercise intervention, skills (Chow et al., 2008) and the coordination tests selected.

Jun Murata et al. (2010) investigated aging affects the human hand function. These results suggested that the manual dexterity in the hand function was weaken with increasing age. Whereas it is possible that this resulted in an inadequate frequency of exercise. Furthermore, it is possible that the moderate intensity of the exercise was not optimum, as some studies suggest that high intensity exercise is more likely to produce cognitive improvement (Angevaren et al., 2007; Brown et al., 2012; Tierney, 2007).

Physical ability difficulties become more common with age because different physical changes are related with aging such as decrease human performances, visual and

hearing impairment, decline muscles strength, muscle tone, changes in senses and affect the physical function capacity and so on (Koskinen et al., 2012; WHO 2015).

GROSS MOVEMENT OF HANDS, FINGER AND ARMS

With advanced age comes a decrease in sensorimotor activity and functioning. These declines in fine motor control, gait and balance affect the ability of adults to execute activities of daily living and maintain their independence. The causes of these motor declines are multi-factorial, with central nervous system declines and changes in sensory receptors, muscles and peripheral nerves playing a role.

In the present study the results have elicited no changes in the Gross movement of hands, finger and arms of both experimental groups due to recreational games training. The Gross movement of hands, finger and arms of the adult tribals were tend to reduce but statistically significant difference was not elicited.

This result due to motor performance declines with aging such as to changes in peripheral structures such as sensory receptors, muscles, peripheral nerves, joints, etc, as well as central nervous system changes. we acknowledge the lack of a control group, and we cannot rule out a potential effect of regression to the mean. Second, small sample size, lack of gender comparisons and deficiency of genotyping can influence the training effect (Barha et al., 2017).

The literature on age-related differences in neural control of movement has not developed as rapidly, but numerous studies have been conducted to date (Harada et al., 2009; Heuninckx et al., 2005, 2008; Hutchinson et al., 2002; Mattay et al., 2002; Naccarato et al., 2006; Riecker et al., 2006; Ward and Frackowiak, 2003).

Motor performance deficits for adults recognized to be due to dysfunction of the central and peripheral nervous systems as well as the neuromuscular system. Motor performance deficits include coordination obstacle (Seidler et al., 2002), increased variability of movement (Contreras-Vidal et al., 1998; Darling et al., 1989), decrease of movement (Diggles-Buckles, 1993).

DEPTH PERCEPTION

There was no significant difference in the scores on different phases of training period in both experimental groups for depth perception. This could be because decreased depth perception with aging is related to anatomical and physiological declines occurring in the eyes (Marsh, 1986).

Analysis of the data revealed some positive effects of the adult tribals on the depth perception and a non-significant but moderate effect was observed. However it is probably that the amount of activities was insufficient to detect changes. Ludeke (2003) found that depth perceptions are more innate and they didn't significantly change after training. Thus the results are in agreement with present study. One of the possible explanations is that the comparably small sample size, has increased the risk of type 2 errors and subject cognitive functioning may have impact data quality.

Basiri et al. (2011) found that training interventions didn't have any impact on depth perception among the participants. It's possible that this stable status may be due to short period of training protocol.

REACTION TIME

In the present study the results have elicited no changes in the Reaction Time of both experimental groups due to recreational games training. The Reaction Time of the adult tribals were tend to reduce but statistically significant difference was not elicited.

However it is probably that the amount of activities was inadequate to occur changes. Galvez et al. (2011) and Whitehurst (1991) found no significant differences due to three aerobic sessions a week. Thus the results are in statement with present study, while Hassmen and Koivula (1997) and Kramer et al. (1999) did. The inconsistent results may be due to variations in intensity and duration of the exercise programmes, compliance and sample differences.

Welford (1980) speculates on the reason for differ reaction time with age. It is not just simple mechanical factors like the speed of nervous conduction. It may be the tendency of adult people to be more careful and supervise their responses more thoroughly (Botwinick, 1966).

However, investigation of effect sizes (variance in the dependent variable accounted for by the group by time interaction) indicated that interaction effects were generally weak. Moreover, a much bigger sample size would have been required to achieve statistical significance.

RESTING HEART RATE

Research studies indicate that in adult people the cardiovascular system declines with age. This deterioration is connected to structural and functional change in the heart and blood vessels, linked with a reduced inotropic and chronotropic response to a catecholamine stimulus (Gerstenblith et al., 1976; Ogawa et al., 1992; Spina, 1999; Stratton et al., 1994).

The results of the study indicate that statistically there was no significant difference in the level of Resting Heart Rate after a sixteen weeks recreational games training at 0.05 level of confidence, yet no significant improvement occurs in case of Resting Heart Rate to observe an positive conclusion because the subjects have decreased their speed in training implementation due to more insistence put on precision and accuracy.

The inconsistent effect of these studies are due to a various of factors. Currently there is no formal training theory that quantitatively and precisely prescribes the structure, duration and intensity of exercise to extract a specific physiological adaptation. The training history of an individual will also effect their physiological response to exercise. Research also indicates that there are individual differences in return to exercise (Bouchard & Rankinen, 2001) and also occur to the changing level of both parasympathetic and sympathetic neural control of the heart (Nakamura et al., 1993; Arai et al., 1989; Yamamoto et al., 1991).

Physiological ageing is also associated with a decreased parasympathetic control of the heart (Arai et al., 1989; Lipsitz et al., 1990). This deterioration in parasympathetic activity with age may be strongly effected by an age-related decrease in fitness level (Goldsmith et al., 1997). However, Tatro et al., (1992) could not elicit a clear interpretation for the change in parasympathetic cardiac control since they found no significant change in initial resting heart rate.

All other sports types also resulted in a decrease of the RHR. However, the recreational games training effects did not reach significance, due possibly to inadequate statistical power due to small sample sizes. The higher the initial RHR, the more the RHR decreased cause by exercise. The effect occurs after increase the duration of training. Furthermore, the participant's age was negatively related with the exercise elicited decrease of the RHR, although the adult participants did not effort in training period less than their younger counterparts.

BLOOD PRESSURE

Physiological ageing is associated with a decline in parasympathetic control of heart rate (Sinnreich et al., 1998; DeMeersman, 1993; Ryan et al., 1994; Tulppo et al., 1998). This decline in parasympathetic control with age may be partly due to a deteriorate in physical fitness with age (Goldsmith et al., 2000; Ingram, 2000). This observed decrease in parasympathetic control may be strongly effected on resting heart rate and blood pressure.

In the present study the results have elicited no changes in the Blood Pressure of both experimental groups due to recreational games training. The Blood Pressure of the adult tribals were tend to reduce but statistically significant difference was not elicited.

The researchers suggested that this could be because of increased parasympathetic and reduced sympathetic cardiac autonomic control. As an individual ages, there is an increase in arterial stiffness that results from progressive reduction of the elastic fibers, a reduce in capillary density and an increase in arteriolar wall thickness. These structural and functional effect, in turn, increase vascular resistance and limit the elicit to vasodilator agents discharged during exercise (Canuto et al., 2011).

However it is probably that the amount of exercises was inadequate to observe changes. Okura et al. (2003) reported no significant occurs in blood pressure due to aerobic dance training. Deborh (1984) also found no significant changes. Thus both the results are in agreement with present study.

TESTING OF HYPOTHESES

Firstly it was hypothesized that there would be no significant improvement due to recreational game training in selected Psycho-Neuro-Physiological variables among male adult tribals.

After sixteen weeks of recreational games training resulted in significant improvement in Self Esteem, Life satisfaction, Locus of control and Self efficacy. Thereby Null hypothesis was rejected at 0.05 level of confidence. However, Illusion, Tactile Sense, Hand Eye Co-ordination, Gross movement of hands, finger and arms, Depth Perception, Reaction time, Resting Heart rate, Systolic blood pressure, and Diastolic blood pressure showed no changes thereby null hypothesis was accepted.

Secondly it was hypothesized that there would be no significant improvement due to recreational game training in selected Psycho-Neuro-Physiological variables among female adult tribals.

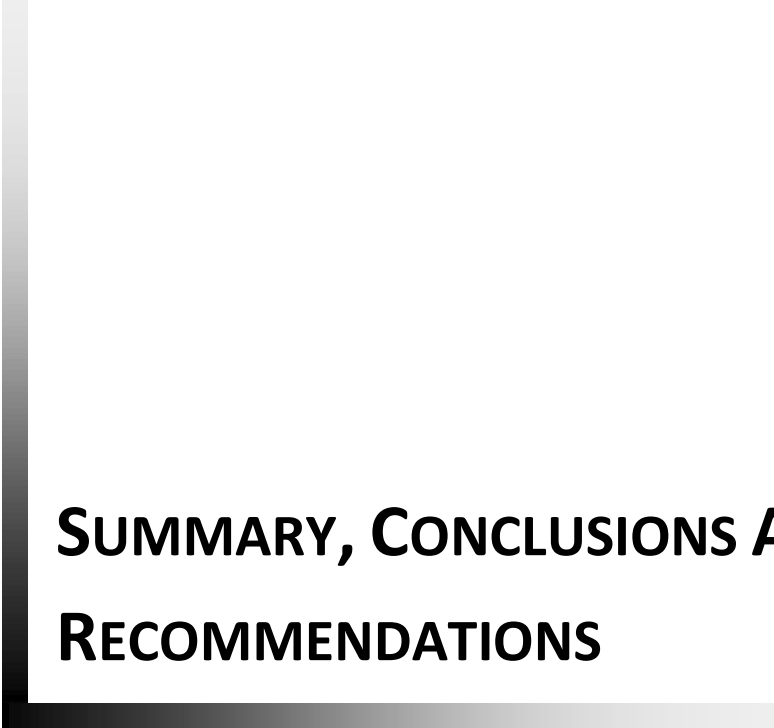
After sixteen weeks of recreational games training resulted in significant improvement in Self Esteem, Life satisfaction, Locus of control and Self efficacy. Thereby Null hypothesis was rejected at 0.05 level of confidence. However, Illusion, Tactile Sense, Hand Eye Co-ordination, Gross movement of hands, finger and arms, Depth Perception, Reaction time, Resting Heart rate, Systolic blood pressure, and Diastolic blood pressure showed no changes thereby null hypothesis was accepted.



CHAPTER



5



**SUMMARY, CONCLUSIONS AND
RECOMMENDATIONS**

SUMMARY

In spite of the apparent evidence that recreation had numerous benefits such as enhanced their psychological well-being, building up a strong communication, improving oneself and the skills, the ability to work in groups, to an improvement in functional abilities and spending their leisure time more effectively and also engaged in recreational activities experienced health promotion and fostered positive social interactions with other participants and these activities had enhanced physiological functioning. However adults can maintain or improve their physical health, overall well-being and quality of life and also maintain personal relationships in the later years of life by regular participating in recreational games. Previous studies have mainly focused on the effects of recreational activities participation and psychological well-being among adults who do not belong to tribal community. Therefore, the aim of the study was to assess the impact of recreational games on Psycho-Neuro-Physiological variables of adult tribals. To accomplish the purpose of the study, forty adult tribals from Village Pandri, Bankura district, West Bengal, India were randomly selected as subjects and their ages ranged from 50 to 55 years (52.4 ± 2.48). The subjects were classified into two experimental groups (male and female), each group was constituted with twenty subjects. In the present study Psycho-Neuro-Physiological variables (Self Esteem, Life satisfaction, Locus of control, Self efficacy, Illusion, Tactile Sense, Hand Eye Co-ordination, Gross movement of hands, finger and arms, Depth Perception, Reaction time, Resting Heart rate, Systolic blood pressure and Diastolic blood pressure) were selected as dependent variables. To measure the dependent variables standardized tests were administered. The independent variable selected in the present study was recreational games training which was administered three days per week in alternate days for a period of 16 weeks.

All the subjects were tested on Psycho-Neuro-Physiological variables prior to the experiment (pre-test), end of eighth week (mid-test) and at the end of experimental

period, sixteenth week (post-test). The training session comprised of warm-up and warm-down. All the tests were well explained and demonstrated to the subjects. Before testing, subjects were given practice trials to become acquainted with the testing procedures. Subjects performed each test as per the testing procedure and the scores of best trials were taken for this study. In the morning on the first day of testing measurements like Resting Heart Rate, Systolic Blood Pressure and Diastolic Blood Pressure and in the evening Hand Eye Co-ordination, Self Esteem and Life Satisfaction were assessed. However, in the morning on the second day of testing measurements like Illusion, Tactile Sense, Reaction Time and Depth Perception and in the evening Gross movement of hands, finger and arms, Locus of Control and Self Efficacy were evaluated.

The data collected from the both experimental groups on selected Psycho-Neuro-Physiological variables were statistically analysed to examine the changes. Each parameter was statistically analyzed adopting standard procedures for testing the difference between the means among before, during and after experimental scores and also for comparing the mean differences. The data under each variable were treated statistically using repeated measures ANOVA and post hoc (LSD) to find the superiority among different phases of experimental periods. All the statistical tests were calculated using the statistical package for the social science (SPSS) for windows (Version 26). The level of statistical significance was set at 0.05 level of confidence. The results were presented in tabular and graphical form. It was evident that the sixteen weeks treatment of experimental groups was proved more efficient in terms of Psycho-Neuro-Physiological variables (Self esteem, Life satisfaction, Locus of control and Self efficacy) among adult tribals.

RESULTS OF THE STUDY

Within the limitations and delimitations of the study, the following conclusions are drawn.

- ❖ There was a significant improvement on Psycho-Neuro-Physiological variables such as Self esteem, Life satisfaction, Locus of control and Self efficacy due to the impact of recreational games training.

- ❖ There was no significant changes to be observed on Psycho-Neuro-Physiological variables such as Illusion, Tactile Sense, Hand Eye Co-ordination, Gross movement of hands, finger and arms, Depth Perception, Reaction time, Resting Heart rate, Systolic blood pressure and Diastolic blood pressure due to the impact of recreational games training.

CONCLUSIONS

Based on the findings of the study, it is concluded that recreational games training is appropriate enough to enhance psychological well-being of adult tribals in short duration that contributes to maintain and improve their quality of life. The results of this study make obvious that recreational games based training is an effective modality to gain positive psychological benefits, such as a sense of optimism, happiness, affirmative moods and feelings of adult tribals. Engagement in recreational games experienced health promotion fostered positive social interactions (Chang et al., 2014) and optimistic views of their own health, which is a critical predictor of psychological well-being and survival in later life (Ruthig et al., 2011).

RECOMMENDATIONS

Based on the results of the study the following recommendations have been made.

- similar study may be undertaken to find out the need and its influence of other important Variables directly and indirectly related to the nature of work and life style of people living in rural areas.
- In the present study, only 16 weeks recreational games training programme was taken in the form of treatment. It is suggested that in future the researchers may undertake study of long term recreational games training programme as treatment on similar variables.
- Investigation can be conducted on sedentary and obese men or women as subjects of the same age group.
- Similar study may be done on middle age people.

- A detailed further study with longer duration may be conducted to alter the changes in the selected criterion variables.
- In the present study only forty subjects were taken. It is suggested that for better observation, more numbers of subjects may be taken.
- Similar study either on different dependent variables or on different age groups can be a relevant option.
- It is recommended that recreational games training may be introduced among teen agers in various educational institutes for improvement in anthropometric, body composition as well as fitness parameters.



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APPENDICES

Appendix – I



T. M. Regd. No. 564838
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Dr. Santosh Dhar (Indore)
Dr. Upinder Dhar (Indore)

**Consumable Booklet
of
SES-DSDU**
(English Version)

Please provide the following information : Date

Name (optional) _____

Age _____ **Sex : Male** ☐ **Female** ☐

Caste _____ **Religion** _____

Education _____ **Designation** _____

Organization _____

Length of Service _____

INSTRUCTIONS

Please write the number of your choice in the parentheses against each statement. Do not leave any statement unanswered. There are no right or wrong answers.

Scoring Table

Factors	I						II					III			IV				V			VI	
Item No.	17	13	5	9	8	18	14	21	15	16	20	2	3	1	6	10	7	4	23	19	22	11	12
Score																							
Sub Total																							
Sub Interpretation																							
Page	2			3			4			Interpretation													
Score																							
Total Score																							

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2 | Consumable Booklet of SES-DSU

Sr. No.	STATEMENTS	Strongly Disagree	Dis-Agree	Neutral	Agree	Strongly Agree	Score
1.	I am a positive thinker.	☐	☐	☐	☐	☐	
2.	I believe in my strengths.	☐	☐	☐	☐	☐	
3.	I have the ability to perform the tasks effectively.	☐	☐	☐	☐	☐	
4.	I know my job well.	☐	☐	☐	☐	☐	
5.	I am capable to cope with difficult situations.	☐	☐	☐	☐	☐	
6.	I always give value to others.	☐	☐	☐	☐	☐	
7.	I have a right to feel good about myself.	☐	☐	☐	☐	☐	
8.	I enjoy overcoming challenging situations.	☐	☐	☐	☐	☐	
9.	I take social responsibility.	☐	☐	☐	☐	☐	
Total Score Page 2							

Sr. No.	STATEMENTS	Strongly Disagree	Dis-Agree	Neutral	Agree	Strongly Agree	Score
10.	I do not hesitate in admitting my failures.	☐	☐	☐	☐	☐	
11.	I like perfection in work.	☐	☐	☐	☐	☐	
12.	I like developing new skills.	☐	☐	☐	☐	☐	
13.	I always view mistakes as learning opportunities.	☐	☐	☐	☐	☐	
14.	I never mind receiving constructive feedback.	☐	☐	☐	☐	☐	
15.	I believe self-awareness is necessary in life.	☐	☐	☐	☐	☐	
16.	I find myself as a value addition to the team.	☐	☐	☐	☐	☐	
17.	I am able to manage stress effectively.	☐	☐	☐	☐	☐	

Total Score Page 3

4 | Consumable Booklet of SES-DSDU

Sr. No.	STATEMENTS	Strongly Disagree	Dis-Agree	Neutral	Agree	Strongly Agree	Score
18.	I am enjoying my life.	☐	☐	☐	☐	☐	
19.	I am aware about my negative thoughts.	☐	☐	☐	☐	☐	
20.	I give credit to other people's thoughts.	☐	☐	☐	☐	☐	
21.	I like openness of thoughts.	☐	☐	☐	☐	☐	
22.	I am a good listener.	☐	☐	☐	☐	☐	
23.	I believe that I have more strengths than weaknesses.	☐	☐	☐	☐	☐	
Total Score Page 4							

Appendix – II

 T. M., Regd. No. 564838 Copyright Regd. No. © A-73256/2005 Dt. 13.5.05 Prof. Hardeo Ojha (Bhagalpur)	Consumable Booklet of LSS-OH (English Version)
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Please fill in these entries :		Date 	
Name _____		Father's Name _____	
Date of Birth 	Gender : Male Female 		
Employed Unemployed 	Designation _____		
Qualification _____			
Married Unmarried Divorcee Widower/Widow 			
Govt. Service Private Service Self-employed Retired 			
Area : Urban Semi Urban Rural 			

INSTRUCTIONS

On the following pages 20 statements about Life Style have been given. Read each statement carefully and decide your response on each on five-point alternatives, viz., **Strongly Agree, Agree, Undecided, Disagree** and **Strongly Disagree**, and put a ☐ mark in the appropriate cell which is close to your response.

Kindly do reply to all the 20 statements.

Your answers will be kept confidential.

Scoring Table

	Raw Score			z-Score	Grade	Level of Life Satisfaction
Page	2	3	4			
Score						
Total						

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2 | Consumable Booklet of LSS-OH

Sr. No.	STATEMENTS	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	SCORE
---------	------------	----------------	-------	-----------	----------	-------------------	-------

1. With the lapse of time things are becoming pleasant for me. ☐ ☐ ☐ ☐ ☐ ☐
2. In comparison to those I know I find myself more fortunate. ☐ ☐ ☐ ☐ ☐ ☐
3. In present times, I do not feel myself happy. ☐ ☐ ☐ ☐ ☐ ☐
4. I am as happy today as I was in the past. ☐ ☐ ☐ ☐ ☐ ☐
5. My life as it is today could have been happier. ☐ ☐ ☐ ☐ ☐ ☐
6. I feel that in future I will have some pleasant and interesting moments. ☐ ☐ ☐ ☐ ☐ ☐
7. At present I find my work as interesting as it was earlier. ☐ ☐ ☐ ☐ ☐ ☐

Total Score Page 2

Sr. No.	STATEMENTS	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	SCORE
---------	------------	----------------	-------	-----------	----------	-------------------	-------

8. Now-a-days I feel myself somewhat indifferent and disappointed. ☐ ☐ ☐ ☐ ☐ ☒ ☐
9. I am satisfied with my present abilities and achievements. ☐ ☐ ☐ ☐ ☐ ☐
10. When I retrospect my past life I feel myself satisfied. ☐ ☐ ☐ ☐ ☐ ☐
11. Even if possible I will not like to change my past life. ☐ ☐ ☐ ☐ ☐ ☐
12. In comparison to my contemporaries I have taken many foolish decisions in my life. ☐ ☐ ☐ ☐ ☐ ☒
13. In comparison to my contemporaries I look more healthier and handsome. ☐ ☐ ☐ ☐ ☐ ☐
14. I have chalked out plan for whatever I have to do after a year. ☐ ☐ ☐ ☐ ☐ ☐

Total Score Page 3

4 | Consumable Booklet of LSS-OH

Sr. No.	STATEMENTS	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	SCORE
---------	------------	----------------	-------	-----------	----------	-------------------	-------

15. When I think about the past years of my life I feel that I could not do those important works, which I must have done. ☐ ☐ ☐ ☐ ☐ ☐

16. I often feel that in comparison to others I am less courageous. ☐ ☐ ☐ ☐ ☐ ☐

17. Whatever I had to get upto this age, I have got much of these. ☐ ☐ ☐ ☐ ☐ ☐

18. Whatever people may say but the average man's condition is continuously deteriorating. ☐ ☐ ☐ ☐ ☐ ☐

19. This is the best time in my life. ☐ ☐ ☐ ☐ ☐ ☐

20. My life is full of repentance. ☐ ☐ ☐ ☐ ☐ ☐

Total Score Page 4

Appendix – III

LEVENSON'S SCALE FOR LOCUS OF CONTROL

Name : _____ Age : _____

Occupation : _____ Sex : _____

INSTRUCTIONS

Below are some statements that pertain to general life outcomes. Please indicate how much you agree or disagree with each statement on a five point scale. The five points are: Strongly Agree (SA), Agree (a), Undecided (U), Disagree (D), Strongly Disagree (SD). You have to put a (x) mark on point which best indicates how closely you agree or disagree with the feeling expressed in each statement AS IT CONCERNS YOU.

Example:

1. Becoming successful is a matter of hard work, luck has nothing to do with it.

1	2	3	4	5
Strongly	Agree	Undecided	Disagree	Strongly
Agree				Disagree

There are no "right" or "wrong" answers as everyone has right to his or her own views. To be able to get best advice from your results, please answer them exactly and truly. When you answer, keep following four points in mind:

1. Give the first, natural answer as it comes to you. Do not spend too much time thinking about your answers.
2. Try not to fall back on the middle, "undecided" answers except when the answer at either ends are really impossible for you.
3. Be sure not to skip anything and answer every statement, somehow.
4. Answer as honestly as possible what is true for you. Do not merely mark what seems "the right thing to say" just to impress the examiner.

If you have understood the instructions clearly, please turn the page and start, if not please feel free to ask for any clarifications.

1. Whether or not I get to be a leader depends on my ability.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
2. My life is controlled by accidental happenings.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
3. I feel like what happens in my life is determined by powerful people.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
4. Whether or not I get into an accident depends on how good driver I am.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
5. When I make plans, I am certain to make them work.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
6. There is no chance of protecting my personal interests from bad luck happenings.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
7. When I get what I want, it's because I am lucky.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
8. Although I might have good ability, I will not be given leadership responsibility without appealing to those in positions of power.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
9. How many friends I have depends on how nice a person I am.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
10. I have found that what I think is going to happen will happen.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
11. My life is controlled by powerful others.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
12. Whether or not I get into a car accident is a matter of luck.
☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

13. People like myself have no chance of protecting our personal interests when they conflict with those of strong pressure groups.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
14. It is not wise for me to plan too far ahead, because many things turn out to be a matter of bad fortune.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
15. Getting what I want requires pleasing people above me.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
16. Whether or not I get to be a leader depends on whether I am lucky enough to be in the right place at the right time.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
17. If important people were to decide they didn't like me, I probably wouldn't make many friends
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
18. I can pretty much determine what will happen in my life.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
19. I am usually able to protect my personal interests.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
20. Whether or not I get into a car accident depends mostly on the other driver.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
21. When I get what I want, it's usually because I worked hard for it.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
22. In order to have my plans work, I make sure that they fit in with the desires of people who have power over me.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
23. My life is determined by my own actions.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree
24. It's a matter of fate whether or not I have a few friends or many.
- ☐ Strongly Agree ☐ Agree ☐ Undecided ☐ Disagree ☐ Strongly Disagree

Appendix – IV

 T.M. Regd. No. 564838 Copyright Regd. No. © A-73256/2005 Dt. 13.5.05 Dr. Arun Kumar Singh (Patna) Dr. Shruti Narain (Patna)	Consumable Booklet of SES-SANS <i>(English Version)</i>
---	---

Please fill in the following informations : Date

Name _____

Age _____ **Sex : Male** ☐ **Female** ☐

Name of School/College _____ **Class** _____

Present Residence : Town ☐ **Village** ☐

Monthly income of parents :

(a) ₹ 50,000 and above ☐ (b) ₹ 30,000 to 49,000 ☐ (c) ₹ 20,000 to 29,000 ☐

(d) ₹ 10,000 to 19,000 ☐ (e) Below ₹ 10,000 ☐

Father's Educational Qualification :

10th/12th/Graduate/Post Graduate/Above Post Graduate _____

Mother's Educational Qualification :

10th/12th/Graduate/Post Graduate/Above Post Graduate _____

INSTRUCTION

Following are some statements which are related to any persons self-confidence, self-respect, promise etc. For each statement, there are five response options like “**Strongly Agree**”, “**Agree**”, “**Neutral**”, “**Disagree**” and “**Strongly Disagree**”. Read each statement carefully and tick ☒ mark only that option which you find that is most appropriate and true in your case. There is no time limit as such but it generally takes about 15 minutes to complete this.

These answers will be always kept confidential.

Scoring Table

	Raw Score			Interpretation
Page	2	3	4	
Score				
Total Score				

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2 | Consumable Booklet of SES-SANS

Sr. No.	STATEMENTS	Strongly Agree	Agree	Neu-trai	Dis-agree	Strongly Disagree	Score
1.	I feel confident about my capabilities that with little efforts I can resolve difficult problems.	☐	☐	☐	☐	☐	
2.	I am confident that I can achieve all targets that I set for myself.	☐	☐	☐	☐	☐	
3.	I am so confident of my capabilities that I can finish tasks on time.	☐	☐	☐	☐	☐	
4.	Despite hard work, I feel I will not succeed.	☐	☐	☐	☐	☐	
5.	I feel I can keep self control even at difficult times.	☐	☐	☐	☐	☐	
6.	In any circumstance, I can achieve what I desire.	☐	☐	☐	☐	☐	
7.	I have enough self-confidence to finish any work.	☐	☐	☐	☐	☐	
Total Score Page No. 2							

Sr. No.	STATEMENTS	Strongly Agree	Agree	Neu-tral	Dis-agree	Strongly Disagree	Score
8.	With my efforts, I can achieve anything.	☐	☐	☐	☐	☐	☐
9.	My own potential and capabilities are responsible for all my achievements so far.	☐	☐	☐	☐	☐	☐
10.	It is usually not possible for me to achieve any targets.	☐	☐	☐	☐	☐	☐
11.	I am able to balance myself even in most difficult times.	☐	☐	☐	☐	☐	☐
12.	I am unable to face difficulties without any help and support.	☐	☐	☐	☐	☐	☐
13.	Even in most difficult situations, I can strategise to resolve and deal with it.	☐	☐	☐	☐	☐	☐
14.	I try my level best to achieve my targets.	☐	☐	☐	☐	☐	☐
Total Score Page No. 3							

4 | Consumable Booklet of SES-SANS

Sr. No.	STATEMENTS	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Score
---------	------------	----------------	-------	---------	----------	-------------------	-------

15. I can keep my cool even when others try to take up fight with me. ☐ ☐ ☐ ☐ ☐ ☐

16. If I get stuck in some work, with little efforts I can resolve it. ☐ ☐ ☐ ☐ ☐ ☐

17. If I try sincerely, I am confident I shall be able to succeed. ☐ ☐ ☐ ☐ ☐ ☐

18. Despite concentrating on my aim, I will fail. ☐ ☐ ☐ ☐ ☐ ☐

19. If I am determined to succeed, I shall be able to achieve success. ☐ ☐ ☐ ☐ ☐ ☐

20. If work as per plan, I shall be able to reap results quickly. ☐ ☐ ☐ ☐ ☐ ☐

Total Score Page No. 4

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INFLUENCE OF RECREATIONAL GAMES ON NEUROPSYCHOLOGICAL ABILITIES OF ELDERLY ADULT TRIBAL WOMEN

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Abstract:

Introduction and Purpose: The purpose of this study was to investigate the effects of 16 Week recreational games training on Hand Eye Co-ordination and Gross movement in elderly adult tribal women. **Method:** The sample consists of total 20 elderly adult tribal women between the ages of 51 to 55 years selected by random method. Participants were given various recreational games training for 3 days and 45 minutes a week. Participants' Hand Eye Co-ordination and Gross movement were measured before, mid and after the recreational games training. The obtained data were evaluated statistically at ($p < 0.05$) level. **Results:** There were significant differences in Hand Eye Co-ordination and Gross movement of elderly adult tribal women participating in the study compared to different phases of training ($p < 0.05$). **Conclusions:** As a result, regular practice of recreational games had positive effect on Hand Eye Co-ordination and Gross movement in elderly adult tribal women aged 51 -55 years. From the above findings it can be said that such regular recreational games are necessary for a healthy life as well as a sense of relaxation and stress reduction is experienced.

Keywords: recreational games, tribal, hand eye co-ordination, gross movement

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1. Introduction

Recreation is an essential part of human life and finds many different forms which are shaped naturally by individual interests but also by the surrounding social construction. Recreational activities can be communal or solitary, active or passive, outdoors or indoors, healthy or harmful, and useful for society or detrimental. The utility of free time and leisure time in a constructive way and to make a person more physically active in order to allow this growth and development to take place proportionately, active recreation activities, other than passive ones are a must (Singh, 2004). A significant section of recreational activities is designated as hobbies which are activities done for pleasure on a regular basis. A list of typical activities could be almost endless including most human activities. Recreational games promote outstanding health to the tribal women, and it is organized purposely to upscale the quality of life. Recreational activities are often done for enjoyment, amusement, or pleasure and are considered to be "fun" (McLean & Rogers, 2005). Recreational programs can be seen as a preprogram that require action in achieving the health promotion among women to solve their difficulties and challenges. Taking part in recreational activities, especially outdoors, can greatly improve physical health, maintain lower body fat percentages, and have lower blood pressure and cholesterol levels. The organized development of recreation programs to meet a variety of physical, psychological, and social needs has led to recreation playing a role as a social instrument for well-being and, in some cases, changes (Hurd & Anderson, 2010). Participating in recreational activities improve their overall health and improve their overall lives. It's well known that outdoor recreation lends itself to both physical and mental health benefits.

Hand eye coordination is the ability of the vision system to coordinate the information received through the eyes to control, guide and direct the hands in the accomplishment of a given task. With high level of coordinative abilities, athletes can learn and improve athletic motor abilities and techniques that are required for the specific sport more promptly and with a higher degree of quality (Hartmann, Minow & Senf, 2002). Coordinative abilities are understood as relatively stabilized and generalized pattern of motor control and regulation process. These enable the sportsman to do a series of movements with better quality and effect (Singh, 1991). Gross movements are involved in movement and coordination of the arms, legs, and other large body parts and movements. Gross movements are big body movements relating to the use of the large muscle of the human body, such as those in the legs, arms, and abdomen and development to take place, the brain, spine, nerves and muscles need to be intact and undamaged. Motor abilities include perceptual and physical factors (Fleishman et al., 1984) in which many important capacities such as general motor coordination (i.e. multi limb and gross body coordination); spatial orientation, balance (i.e. gross body equilibrium), strength, and power are involved. Gross movement patterns in competitive sport have often been analysed to shape optimal training sessions in numerous sports. Only the work of Hughes and Meyers (2005) attempts to link movement patterns to rally

outcomes and sequences of these patterns to obtain a much more relevant picture of what exactly happens in the game. In addition, some studies suggest that differences in gross motor coordination may exist, although far less empirical research has focused on these types of skills (Haslum, 1989; Merriman & Barnett, 1995). Very few researches have been done on recreational games and its effect, hence the researcher finds it fruitful to work on the title entitled "Influence of Recreational Games on Neuropsychological Abilities of elderly adult tribal women".

2. Materials and Methods

2.1. Sample

The participants were informed for the study's aim and general requirements. In addition, all the subjects were asked to continue their daily habits without any alterations through the 16-week period. The entire subject fulfilled the required conditions. More specifically, the participants had to be healthy, not undergoing any medication or any form of diets, as well as not participating in any physical activity or exercise individually or in group for the past six months. A written informed consent for the participation in the research was obtained from each subject. All the subjects had to agree that they will not participate in any other group or individual exercise, physical activity or any other programme for the duration of the experiment, i.e. 16-week period. For the purpose of the study 20 elderly adult tribal women in the age group of 51 to 55 years belonging to Bankura district of West Bengal state in India were selected randomly as subjects for the present study.

2.2. Procedure of Data Acquisition

Hand Eye Co-ordination and Gross movement of hands, finger and arms were taken as the variables of physical characteristics. Hand Eye Co-ordination of the subjects was taken by Mirror drawing test and the time was recorded to the nearest 1/10th of a second. To measure the Gross movement of hands, finger and arms of the subjects was taken by Finger Dexterity Test with pins and it was recorded to the nearest seconds.

2.3 Statistical Technique

The dependent variables, namely Hand Eye Coordination and Gross Movement of Hands, Finger and Arms were tested if they were normally distributed by using the Kolmogorov-Smirnov tests of normality; parametric tests. The measurements from the three Recreational games training phases on the selected variables were subjected to the statistical analysis to check any significant difference between the phases using the 'Repeated Measures Analysis of Variance (ANOVA)'. The LSD post-hoc test was used to elucidate the difference between pair-wise means and the level of significance was set at 0.05 level of confidence.

2.4. Recreational Game Training Program

The experimental design (pre, mid & post-test design) and simple random sampling technique was used in this study. Various types of recreational games training was given for a period of 16 weeks, 3 days per week, 30 minutes according to the progressive training method. Subjects were given a 5 min warm-up exercise before starting the game, and a 5 min cool down exercise at the end of the game. At the beginning of the study (i.e. pre-test), during the training (i.e. mid-test after 8th weeks) and as well as at the end of the treatment period (i.e. post-test after 16th weeks) the measurements were recorded.

3. Results

Table 1: Repeated measures analysis of variance computed for elderly adult tribal women on hand eye co-ordination and gross movement of hands, finger and arms

Variables	Sources of Variation	Sum of squares	Degrees of Freedom	Mean sum of squares	F-Value
Hand Eye Co-ordination	Between Groups	47.34	2	23.67	*37.22
	Error	24.17	38	0.64	
Gross movement of hands, finger and arms	Between Groups	865.73	2	432.87	*54.78
	Error	300.27	38	7.90	

*Significant at 0.05 level table value 3.20.

From the above table it is clear that there was significant difference in the different training phases means of the elderly adult tribal women in the variables i.e. hand eye co-ordination and gross movement of hands, finger and arms since the obtained F value 37.22 and 54.78 respectively were greater than the table value 3.20 with 2 and 38 degree of freedom at 0.05 level of confidence. Further LSD post hoc test was applied to find out the effectiveness of the Recreational games training in different phases. It is understood from the result that there was a significant improvement in the hand eye co-ordination and gross movement of hands, finger and arms of the elderly adult tribal women due to the recreational games training.

Table 2: Post Hoc (LSD) Mean comparison of Variance of hand eye co-ordination and gross movement of hands, finger and arms of elderly adult tribal women

Variables	Pre-Training Phase	Mid Training Phase	Post training Phase	Mean Difference	Confidence Interval
Hand Eye Co-ordination	12.69	11.66		*1.03	0.81
	12.69		10.52	*2.17	
		11.66	10.52	*1.14	
Gross movement of hands, finger and arms	214.45	209.55		*4.9	2.84
	214.45		205.15	*9.3	
		209.55	205.15	*4.4	

*Significant at 0.05 level of confidence.

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The above table proved that there were significant differences existed between the different phases as the confidence interval required to be significant at 0.05 level was 0.81 and 2.84 respectively and the obtained values were greater than the required value. It was understood from the result that experimental treatments of different recreational games training significantly improved hand eye co-ordination and gross movement of hands, finger and arms of elderly adult tribal women in a progressive way from pre, mid to post phases.

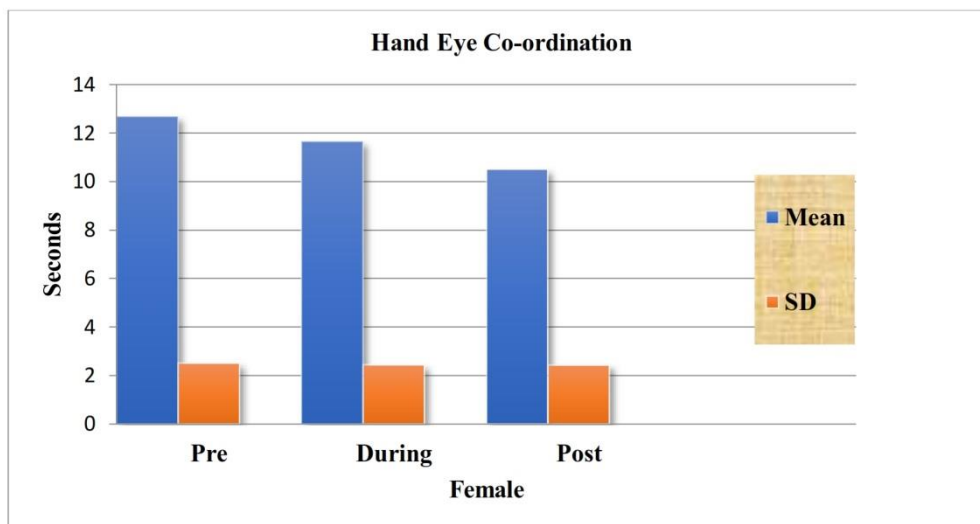


Figure 1: Comparison of Means and SD in hand eye co-ordination after sixteen weeks of recreation games training in elderly adult tribal women

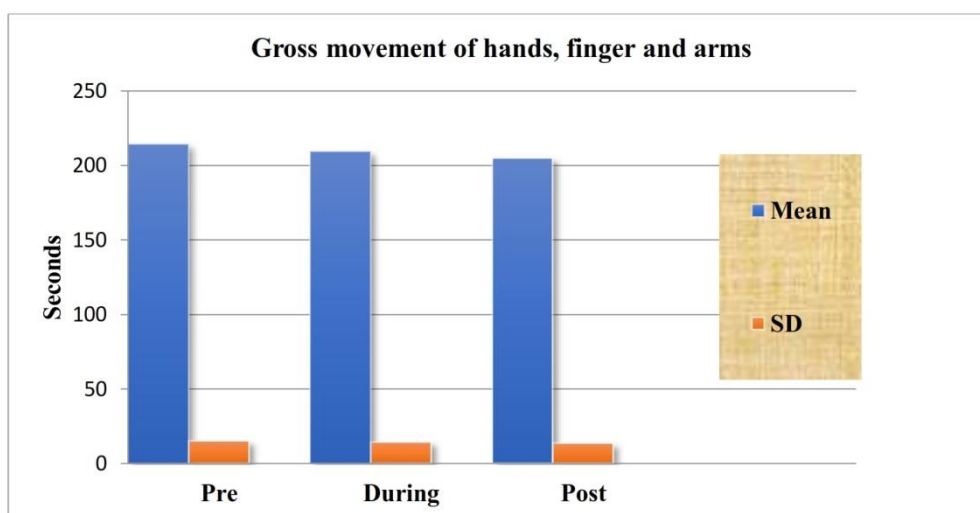


Figure 2: Comparison of Means and SD in gross movement of hands, finger and arms after sixteen weeks of recreation games training in elderly adult tribal women

4. Discussion

The findings of the undergone research support the hypothesis by evidently showing that the elderly adult tribal women, after their participation in the Recreational games training, unveiled significant influence on hand eye coordination and Gross movement. Paul et al. (2011) expressed that significant improvement was found on hand eye co-ordination after recreational games training. These findings are consistent with the literature reviewed by Cohen (1988). Akarsu et al. (2009) explained that sport activities are beneficial to both eye-hand reaction time and visuospatial intelligence.

This helps participate in recreational activities for a longer period and more often, making them create a positive atmosphere and enhancing healthy lifestyle can minimize worries, tension and obstacles under any stressful event circumstance. The findings mentioned above are partially consistent with those of Cohen and Wills (1985) showing that humor styles attract more people, and help them maintain fellowship, and develop social networks, leading to psychological and physical benefits. Thus, the findings of the present study support the position that leading an active lifestyle, here assessed by engagement in leisure activities, is a universal and culture-independent means contributing to successful aging, invariant across different countries and cultures. The benefits of physical activity on cognitive function can be attributed to an ameliorated overall health condition (e.g., brain oxygenation and stimulation of neurogenesis) (Kempermann et al., 2010). Therefore, it is considered that to make women have a habit of participating in recreational games on a regular basis is very crucial for quality of life which makes it possible for to be fruitful and successful in life. Recreation is allowed to be used as a tool of therapy. Recreation can be effective if it is used appropriately in accordance with different ages and abilities. Group activities in recreation programs improve interpersonal skills, independence, and positive self-esteem which can bring about a lot of benefits in the psychological aspect. Like this, a wide range of activities which can promote physical, psychological, social, and emotional function and improve the quality of personal life. In particular, there is a recreational activity accompanying joy called physical activity-based recreation (Koo & Lee, 2015). Participation in the physical activity-based recreation helps participants recover from the deteriorated physical strength, caused by the lack of exercise, and develops the latent ability to achieve self-realization. Accordingly, recreation games can help physical and emotional development and cultivate optimism are being operated.

5. Conclusion

The research on the participation of elderly adult tribal women in recreational games shows that recreational games training had a positive effect on hand eye coordination and gross movement. Therefore, it is judged that making women have a habit of regular participation in recreation is considered important for healthy lifestyle.

Acknowledgment

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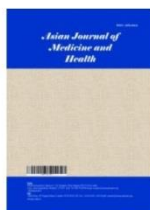
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The Effects of Participating in Recreational Games on Health Markers and Reaction Time in Middle-aged Tribal Women

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Authors' contributions

This work was carried out in collaboration between both authors. Author MKM designed the study, performed the statistical analysis and wrote the protocol. Author GCS wrote the first draft of the manuscript, managed the analyses of the study and managed the literature search. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Taking part in recreational activities, especially outdoors, can greatly improve physical health. People, who take part in park activities such as walking, hiking, or skiing, schedule fewer office visits, maintain lower body fat percentages, and have lower blood pressure and cholesterol levels. Although recreational games was proven to be a useful physical activity to stimulate some health benefits, we do not know if there are significant benefits of recreational games played on a smaller area with fewer players in the middle-age population. Because exercise is known to increase blood flow and oxygen to the skeletal muscles and the brain, it was inferred that exercise would also affect an individual's reaction time.

Aims: The present study aimed to investigate whether recreational games could improve health and reaction time of middle-aged tribal women after 16 weeks of training. To determine this, twenty subjects gave baseline blood pressure, heart rate, and simple reaction time measurements.

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Methodology: Twenty healthy middle-aged tribal women aged 50–55 were randomized in a group to involve in recreational games training (n = 20; age: 52.4 ± 2.48 years). The participants performed 3 training sessions of 40 min per week.

Results: Results from a repeated measure ANOVA indicated a time interaction (pre training, mid training and post training) for Blood Pressure (Systolic), Blood Pressure (Diastolic), Resting Heart Rate and Reaction Time (Audio) in favor of the participants. The results concluded that Recreational games can be an effective training modality to stimulate a decrease in resting HR and reaction time with small improvements in systolic and diastolic Blood Pressure.

Conclusion: To participate in Recreational games only three times per week shows helpful health-related adaptations and decreased reaction time, means there was significant improvement in health markers and reaction time abilities, which may be an affirmative impact to the reduction of the risk of developing lifestyle diseases and is beneficial to people in their daily live.

Keywords: Recreational games; tribal women; reaction time; health markers.

1. INTRODUCTION

Regular physical activity in adults can reduce the risk of hypertension, cardiovascular disease, osteoporosis, type 2 diabetes mellitus, obesity, anxiety, and depression [1]. Wen et al. stated that 90 min per week or 15 min per day of moderate-intensity physical exercise might benefit individuals with the risk of cardiovascular disease. However, various barriers exist that prevent adults from fulfilling this physical activity recommendation (e.g., lack of time or uncertainty about the amount of exercise required to benefit health) [2]. Nevertheless, staying physically and mentally fit is one of the essential properties in middle-aged adults' life [3]. Playing basketball small-sided games in recreational settings utilizes anaerobic and aerobic metabolism pathways, leading to significant improvements in musculoskeletal and cardiovascular fitness [4]. Worldwide, obesity is considered to be the epidemic of twenty-first century, and is related to the development of insulin resistance and diabetes, as well as to the predisposition to increases in serum levels of cholesterol and systolic blood pressure (SBP) and diastolic blood pressure, which are risk factors for cardiovascular disease (CVD) [5].

Recreational games can be considered a useful, low intensity, enjoyable exercise intervention with a broad range of health and fitness benefits in middle age women but also for the general population. Moreover, considering the popularity of Recreational games worldwide, training studies using this sport as a health and physical fitness enhancing intervention are warranted. Participating in such recreational activities at early ages boosted the odds of continuing such activities later in life [6].

Health is not only about fighting disease, but also a phenomenon that aims to protect the individual, the family, and society to improve the general health of human beings, including their social and professional lives. Traditionally, continuous exercise-based physical activities such as brisk walking, running, and cycling have been used as health-promoting activities [7,8]. The systolic blood pressure (SBP) increases directly proportional to the increase on the cardiac debt. The diastolic blood pressure reflects the efficiency of the local vasodilator mechanism of the muscles in activity, which is as high as the local capillary density [9,10]. Some studies have shown that heart rate (HR) is higher during small-sided games formats with fewer players [11,12,13]. Several studies have shown positive health effects of participation in recreational football for untrained adults [14,15,16,17].

Difficulties in the integration of perceptual information into motor action may result in inadequate solutions to daily motor problems. Intellectual disability relates to inability to integrate visual inputs and hand movements [18]. Reaction time, defined as being the time between the application of a stimulus and the beginning of an organism's response to it, has been shown to be a valid indicator of the central nervous system's ability to receive and synchronize movement expressed through the peripheral nervous system [19]. There are multiple stimuli and multiple responses and the reaction must correspond to the correct stimulus [20].

The hypothesis for this study is that participants' reaction times will improve following recreational games training; therefore, supporting the idea that exercise is beneficial and can improve an

individual's simple reaction time abilities as well as heart rate and blood pressure also.

2. MATERIALS AND METHODS

2.1 Subjects

Twenty healthy middle-aged tribal women aged 50–55 years took part in the Experimental study. All the participants had some previous experience with recreational games and were recruited with the help of orientation program. The participants did not take medication and had not been involved in any type of organized physical training for at least two years. The subjects were matched and randomly assigned to experimental group ($n = 20$; age: 52.4 ± 2.48 years). The participants carried out a 16 week recreational games training program. In the study, the participant's heart rate, blood pressure, and reaction time were measured before, during and after the completion recreational games training program. Prior to exercise, participant's heart rate, blood pressure, and reaction time were taken respectively, and were measured to have baseline statistics in the mid of the training session (after eight weeks) and also at end of the training session (after sixteen weeks). These measurements were compared to values taken after exercising.

2.2 Procedures

Subjects were familiarized with all test procedures. Prior to exercise, resting heart rate and blood pressure were determined from 7 to 9 a.m. under standardized conditions after an overnight fast. Blood pressure was measured by Sphygmomanometer (blood pressure cuff), and an average value was calculated. The participant's baseline heart rate was measured using the Pulse Ox (heart rate monitor). The heart rate monitor was placed on the participant's non-dominant index finger. Before recording the resting heart rate, the subjects were instructed to remain lying on their bed. The Subjects were tested on psychomotor variables namely reaction time. The selected criterion variable auditory reaction time was tested with Modified chronoscope.

2.3 Intervention Program

The participants in middle age tribal women performed recreational games and received

guidance in experimental protocol, during 16 weeks, with 48 sessions of 40 minutes each. Each session comprised 5 minutes of stretching, 30 minutes of recreational activities on the basis of low to moderate (different types of recreational game), and 5 minutes recovery time. Different types of recreational game includes Walking relay, Ball roll relay, Snatch ball, Move down or up, All up relay, Waist catch, Arm roll relay, Target pass, Tunnel ball relay, Ball bounce relay etc. and was used in simple to complex manner.

Recreational games were planned with the help of experts in recreation activities and the subjects were monitored by an experienced physical education teacher and the researcher himself to ensure that the participants would be active throughout the period doing activities at a low to moderate for maintaining progressive of load.

2.4 Statistical Analysis

The entire initial (Before training), mid (After eight weeks of recreational games training) and post-test measurements (after sixteen weeks recreational games training) were taken. The level of confidence was fixed at 0.05. A repeated measure ANOVA with Least significant difference post hoc tests was computed to test for interactions and main effects for time (pre-test vs. mid-test, mid-test vs. post-test and pre-test vs. post-test) on the criterion variables.

3. RESULTS AND DISCUSSION

According to researcher's knowledge, this may be the first study examining the effect of recreational games on health markers and reaction time in middle-aged tribal women. We found that 16 weeks of recreational games decreased some risk factors, resting HR, systolic BP and diastolic BP compared to the initial stage. Moreover, subjects showed better results in health markers and reaction time compared to the preliminary condition. These findings partially confirmed the study hypothesis with positive effects on health markers and reaction time.

Several studies have exposed that team-sport activities such as recreational football, volleyball, basketball, and handball effectively decrease blood pressure [21,22]. Additionally, one study exposed that only eight sessions of high-intensity

interval training and moderate-intensity continuous training programs improved systolic blood pressure [23]. In this study, systolic blood pressure was lowered after training in the participants. This finding indicates that regular practice of recreational games positively affected the cardiovascular system of the participants. Resting HR has been suggested as a non-invasive, powerful, and independent predictor of cardiovascular diseases [24,25].

The practice of physical exercises, promoted perceptible effect on the reduction of the blood pressure levels [26]. Blood pressure has

increased with acute exercise and can therefore be concluded that exercise helped the brain react to stimuli faster. By binding to beta-2 receptors on the vessels, epinephrine causes dilation to occur and a decreased total peripheral resistance. Both of these changes allowed for an increase blood flow to all areas of the body. A study concluded that more blood flow allowed the brain to have better cognitive functioning [27].

The importance of this experiment can be related to many individuals in improving their everyday life and their health, specifically related to middle age tribal women.

Table 1. Summary of ANOVA experiment with repeated measure for the data pre-test vs. mid-test; mid-test vs. post-test and pre-test vs. post-test of the criterion variables: Blood pressure (systolic), blood pressure (diastolic), resting heart rate and reaction time (audio)

Variables	Sources	Sum of squares	DF	Mean square	F
Blood Pressure (Systolic)	Contrast	17.03	2	8.52	9.44*
	Error	34.30	38	0.903	
Blood Pressure (Diastolic)	Contrast	11.23	2	5.62	6.65*
	Error	32.10	38	0.845	
Resting Heart Rate	Contrast	19.90	2	9.95	29.62*
	Error	12.77	38	0.336	
Reaction Time (Audio)	Contrast	0.16	2	0.08	68.41*
	Error	0.05	38	0.001	

Table F ratio at 0.05 level of confidence for df 2, 38 was 3.20

*indicates significance at 0.05 level

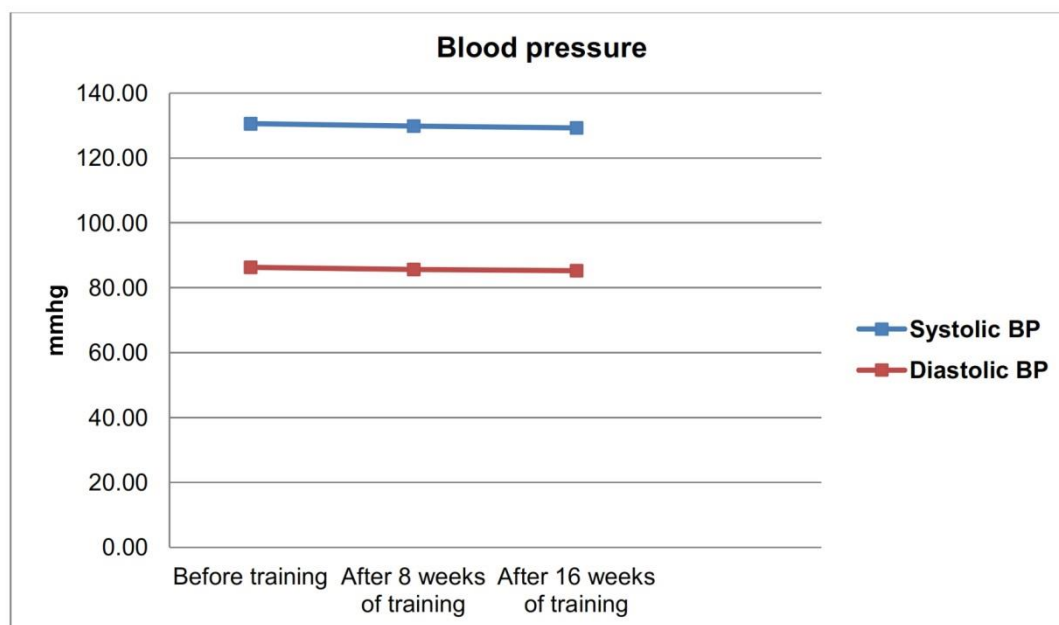


Fig. 1. Comparison of mean scores of systolic and diastolic bp in different phases of recreational games training

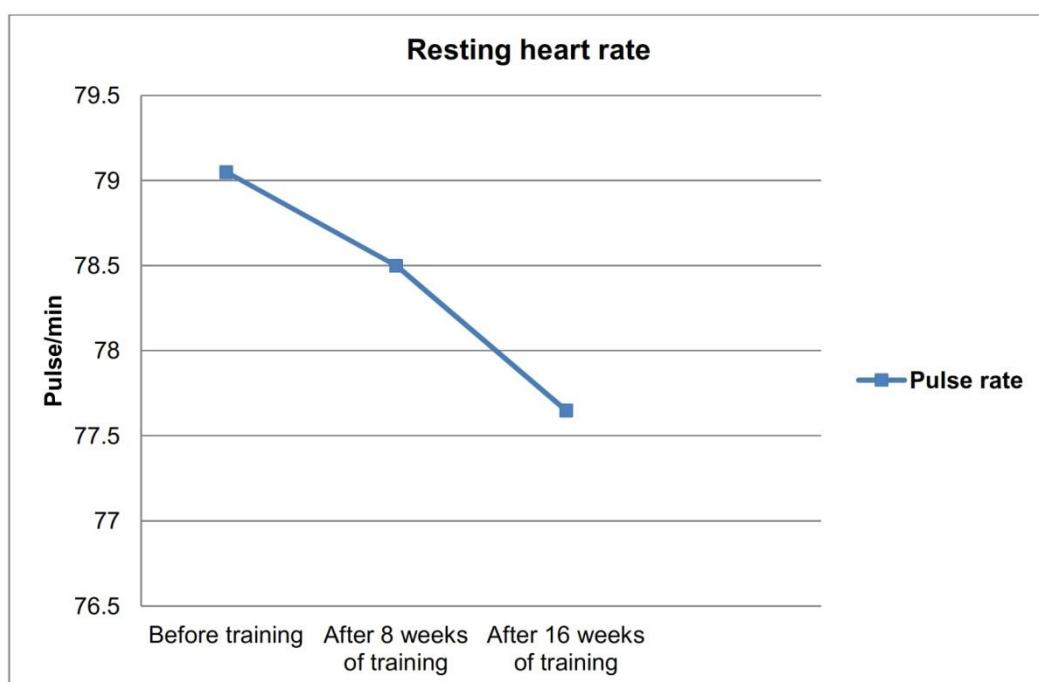


Fig. 2. Comparison of mean scores of resting heart rate in different phases of recreational games training

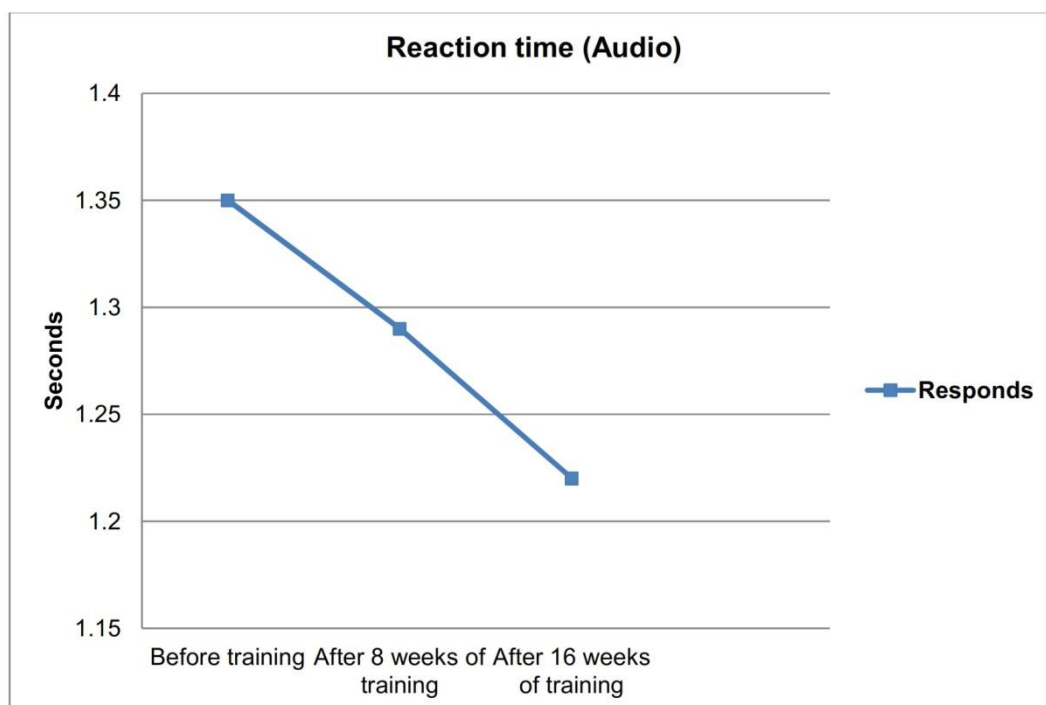


Fig. 3. Comparison of mean scores of reaction time (audio) in different phases of recreational games training

Table 2. Post hoc (LSD) comparison of the group means difference of the data pre-test vs. mid-test; mid-test vs. post-test and pre-test vs. post-test of the criterion variables: Blood pressure (systolic), blood pressure (diastolic), resting heart rate and reaction time (audio)

Variables	Pre test	Mid test	Post test	Mean difference	Confidence interval
Blood Pressure (Systolic)	130.55	129.80	-	0.75	0.96
	130.55	-	129.25	1.3*	
	-	129.80	129.25	0.55	
Blood Pressure (Diastolic)	86.30	85.65	-	0.65	0.93
	86.30	-	85.25	1.05*	
	-	85.65	85.25	0.4	
Resting Heart Rate	79.05	78.50	-	0.55	0.58
	79.05	-	77.65	1.40*	
	-	78.50	77.65	0.85*	
Reaction Time (Audio)	1.35	1.29	-	0.06*	0.03
	1.35	-	1.22	0.13*	
	-	1.29	1.22	0.07*	

*Significant at 0.05 level of confidence

4. CONCLUSION

Since the experiment was conducted on participants ranging from 50-55 years old, as mentioned above, establishing an exercises schedule early in life could help improve overall health later in life therefore, live a longer life. Recreational games can be an effective training modality to stimulate decrease in health risk factors and resting HR. However, it was also beneficial in improving blood pressure and it can also improve one's reaction time. However, this study shows that recreational games sessions per week can give meaningful benefits to the participants. This is of great importance considering that people with limited leisure time can practice recreational games three times per week and improves overall health.

CONSENT

For the purpose of data collection, informed consent was obtained from the study participants before administering the Test and Training Protocol and objectives of the study was explained to the participants by the data collectors.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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