INTRODUCTION

1.1 General Introduction

Aging is a universal process of growing old. It touches everyone regardless of age, gender and socio-economic level. We are all travelling at different speeds to the same destination (Birren, 2000).

Aging is the accumulation of changes in a person over time (Bowen & Atwood, 2004). In the past five to six decades, understanding the aging process and the prospects of regulating longevity has captured the imagination of scientists all over the world. Although death is inevitable, understanding the process of aging and elucidating how and why cells and eventually organisms die, can greatly help us understand and modulate many disease processes that occur with age, thereby enabling us to come up with useful interventions. Research on aging in India has been well documented since ancient times. As way back as 3000 BC – 1500 BC, the Indian medical system of Ayurveda was used as a means for the prevention of the effects of aging and generation of disease in organs or the whole organism, respectively. In recent years, the focus has been demographic studies on different aspects of aging and has been in isolation (Ashok & Ali, 2003).

The aging process is a serious human problem. Since they are considered non-productive and as they also do not generate any hope, it is all the more necessary that serious attention is paid to them. They raise moral questions and direct our attention towards transcendental values. In the past, aging was not a serious issue and societies did not give it priority. They dealt with it as a natural phenomenon. Family members were responsible for the care and management of the old. But now the situation is different.

Worldwide, there are currently more than 600 million people over age 60 years. By the year 2050, that number will increase to almost 2 billion, roughly
20% of the world population at that time. By 2050, there will be more people over age 60 than there will be under age 15; that is a dramatic change (http://njmsz.umd.edu/hwmedweb/archives/agingarchive.htm.02.12.11)

Population aging is a worldwide phenomenon, and India is not exception to the rule. Census reports indicate that the Indian population has approximately tripled during the last 50 years, but the number of elderly Indians has increased more than fourfold. When considering the continuation of the trend, the United Nations predicts that the Indian population will again grow by 50% in the next 50 years, whereas the elderly population is expected to grow another fourfold. The size of India’s older adult population is greater than the total population of many developed and developing countries. According to World Health Statistics, 2011, 83 million persons in India are 60 years of age and older, representing over 77% of the nation’s total population (WHO, 2011).

Over the next four decades, India’s demographic structure is expected to shift dramatically from a young to an aging population resulting in 316 million elderly persons by 2050 (Dabas, 2012). In India at least 5% of elderly persons in both urban and rural areas live alone (Govt of India Report, 2006).

The processes of aging and the associated infirmities with advancing age require investigation and understanding from different perspectives. Since, the processes of aging are complex and combined with the uncertainties about death – a fertile ground of myth, fantasy and wishful thinking has always existed. These speculations have given rise to myth about the prolongation of life and the nature of death. Some elements of these myths have been displaced by the information provided through scientific research but many still remain as a part of our cultural heritage (Mridha, 2012).

1.2 Aging – A Natural Phenomenon

Many of the processes and mechanisms of aging are universal in that similar changes of human behaviour are observed roughly at the same age across
persons. Many of these processes are controlled by ‘biological clocks’ (Kinney, 1982).

It is to be believed that the life spans of all multi-cellular organisms including man are genetically programmed. Since the expression of genes are influenced by environment, a number of factors such as nutrition, physical exercise, stress, lifestyle etc. are known to modulate the rate of aging process while some of the factors such as dietary restriction, physical exercise, and improvement and moderation in lifestyle have shown beneficial effects; and the stress factors (physical and/or mental), in general, accelerate the rate of aging (Patnaik, 1997).

End of life does not come all of a sudden for most of us. Instead, we slowly wear down our looks, faculties; our health declines, hair and teeth begin to fall out and our minds dim. Like all aging machines, an individual body too tends to work less efficiently than when it was ‘new’. Functional loss does not begin in old age but in early adulthood and different faculties having its different systems decline with different rates (Mridha, 2012).

1.3 Historical Background of Aging Research

‘Gerontology’ is the study of the phenomena of aging from a research and scholarly perspective. It embraces studies from the biological, behavioural and social sciences. Gerontology is an ancient subject but a recent science and its background may be divided into several periods: a) the Mythic period from pre-historical period to Greco-Roman era; b) the philosophical period – from Greco-Roman days to the Renaissance; c) the Renaissance d) the early scientific period, from about 1600 – 1800 AD; e) the expansion of Empirical Research, from 1800 to about 1930 AD; and f) Modern Gerontology, about 1930 AD onwards (Birren, 1996).

The traditional Indian view of life based on the assumption that there is a preordained cosmic order in which each individual lives through stages en-route to some ultimate transcendent state. The background for Indian thought is a mixture of philosophy, religion and practice of a long existing culture; although it did not
stimulate scientific research on aging. It was believed that man’s life passes through four stages on ‘ashrams’ a) Brahmacharya or studenthood (birth–25 years), b) Garhastha or householder (25 – 50 years), c) Vanprastha of forest dweller (50–75), and (d) Sanyas or renouncer (75 years onwards). The West has been influenced by the Christian view that the individual is ultimately resurrected for eternal life. Both Hinduism and Christianity regard the conditions of future existence as being a consequence of present moral behaviour (Chadha, 1997).

The expansive period of science was based upon the conviction that all phenomena of nature are lawful and that these laws can be determined through scientific investigations. The first application of this point of view in the study of aging was done by Lambert Quetelet, A (1796–1874) a Belgian Scientist. In 1835 he quoted “Man is born, grows up and dies, according to certain laws which have never been properly investigated, either as a whole or in the mode of their mutual reactions”(Quetelet 1968). At the beginning of the twentieth century, a number of biologists began to write prolifically about aging. Their underlying theme was the identification of causes of aging or the transformations that occur with age in the human species. The writings of the day were surrounded by a great deal of optimism about the potency of science. No problem appeared to be beyond its understanding and perhaps even the extension of the human life span was potentially under human control (Birren, 1996).

Advanced countries have sensed this imminent ‘grandparents boom’ almost 50 years ago and launched measures to alleviate the pressures that this demographic change could bring in. The reasons for the expected changes were looked into. It was obvious that reduction in the infant mortality coupled with improved nutrition and health care, resulting from the fruits of medical and biological research are the reasons. It would be unwise and even uncivilized to make any effort to reverse these achievements. On the other hand, emphasis was turned to see why we become ‘old’ and what is the molecular mechanism(s) of this fascinating yet undesirable process would it be possible to modulate / control this process? The science of getting ‘old’ was born with a bang. Separate institutes and
centres were created both from philanthropic and Governmental initiatives to understand the science of aging and age, associated disabilities as well as to formulate innovative and humane management of the elderly. Above all, to examine, how to prolong the ‘health span’ of aging population and convert them into a national asset is an important aspect (Rao, http://www.silverinnings.com. 17.09.2011).

The aging is one of the thrust areas of research in almost all the developed nations and many others are following the suit. For example, National Institute on Aging (NIA) has been created by the USA. Many other countries like Japan have followed the suit. In fact the European countries have got together and formed a European Research Area in Ageing (ERA, 2005). Apart from the State supported new institutes, already existing centres, universities have created divisions and centres for gerontological research. These initiatives are yielding rich dividends. Tremendous progress is being made in understanding the biological, clinical and behavioural aspects of the phenomenon of getting ‘old’. Attempts are being made to examine whether the process of aging can be modulated at genetic, molecular and social levels. Extensive research is also going on to examine the possibility of attenuating the deleterious effects of age dependent disorders including neurodegenerative diseases like Alzheimer, Parkinson, Huntington, Stroke, etc. (Rao, http://www.silverinnings.com. 17.09.2011).

Activities in gerontology began to accelerate shortly after World War II ended in 1945. Gerontological organisations have emerged to stimulate research, teaching and service with great importance to the development of increasingly sophisticated theory and research on aging. Because of the importance of knowledge and research on ageing for the well-being of present and future generations, there seems no doubt that the need for study on aging will remain a higher priority in academic and professional setting as it has crossed the threshold of individual concern (Chadha, 1997).

Independent India is just 60 years old. At the time of independence, the average life expectancy in India was around 40 years. Clearly old age was not a
problem to worry about. On the other hand, the average life expectancy of an Indian today is reported to be around 62 years and this figure is improving. As already mentioned, it is projected that there will be more than 150 million people above 60 years of age by 2050. This changed demographic profile is likely to exert immense pressure on the Government and the people themselves in many ways. Ancient India has developed medical systems to rejuvenate the health of individuals. Ayurveda is essentially a ‘rejuvenating medicine’. Modern India has tried hard to control the rapid growth of its population through scientific methods. Modern India is supporting even subjects like fashion technology in order to be in line with developed nations. Therefore there is no reason why India should not do anything to achieve ‘Quality Aging’ for its aging population so that this experienced section of the society could be converted into an asset. There is need for launching initiatives to promote research in basic aspects of aging process as well as applied research to innovate scientific methodology to manage elderly people. So far Indian Council of Medical Research is concerned it is the only organisation that has taken at least minor initiatives to promote aging research. A much bigger initiative from different quarters is needed if India has to escape the demographic shocks. India must in its own interest promote research on aging and associated diseases in a big way (Chadha, 1997).

The National Policy on Older Persons seeks to assure older persons that their concerns are national concerns and they will not live, unprotected, ignored and marginalized. The National Policy aims to strengthen their legitimate place in the society and to help older people to live the last phase of their life with purpose, dignity and peace. The National Policy on Older Persons inter alia visualizes support for financial security, health care and nutrition, shelter, emphasis upon education, training and information needs, provision of appropriate concessions, rebates and discounts etc. to Senior Citizens and special attention to protect and strengthen their legal rights such as to safeguard their life and property. The National Policy on Older Persons confers the status of senior citizen to a person who has attained the age of 60 years.
This above avowed policy has been capped very recently, in Dec 2007, by a bill passed by the Parliament of India. This bill is named “The maintenance and welfare of parents and senior citizens bill-2007” (Rao, http://www.silverinnings.com.17.09.2011).

1.4 Theories of Aging

Aging has many dimensions. Therefore different theories have been propagated to explain the phenomena from different views and perspectives. Those theories have been classified into three broad categories – biological theories, genetic theories and non-biological theories. Biological theories contain - evolutionary theories, telomere theory, reproductive-cell cycle theory, DNA damage theory and autoimmune theory. Genetic theories are - accumulative-waste theory, wear-and-tear theory, somatic mutation theory and error accumulation theory, cross-linkage theory, free-radical theory, inirepair-accumulatory theory. Non-biological theories are - disengagement theory, activity theory, selective theory and continuity theory (http://en.wikipedia.org/wiki/Ageing.07.01.2013).

1.5 Different Dimensions of Aging

Never before in the human history have so many survived to old age. There are no guidelines for the increasing number of elderly because they have not existed before in such a large proportion. During the beginning of the modern period of gerontology, researchers have taken a multidisciplinary approach and considered human functioning from analysis of multi-factorial processes having genetic, behavioural and environmental basis (Mridha, 2012). Therefore, to understand an individual’s aging process in the context of performance in physical, motor and psychosocial behaviour such dimensions require to consider for proper understanding of the aging process.

1.5.1 Physical and Physiological Aspects of Aging

Many of the physical and physiological changes occur not only aging per se but due to diseases in the elderly age and it is difficult to exclude the cumulative effects of diseases contracted earlier in life (Birren et al., 1963). Functional loss
takes place at the three levels – i) the tissue level - there is loss of collagen, ii) the cell level - decline in the efficiency of mitochondria that generate energy within the cell and iii) the molecular level - DNA might mutate resulting in insufficient cell replacement or even its cessation. These changes have deleterious impacts upon the bodily systems (Mahajan, 1997).

Until the middle of 50s the men body weight tends to increase and decline thereafter. The rate of weight loss accelerates in the late 60s and 70s. In women, body weight continues to increase into the 60s and then to decline, but at a rate slower than that in men. The increase in body weight in middle age, the 'middle-age spread' appears to be the product of reduced physical activity in an environment where food is plentiful, since members of more primitive societies did not show this change (McArdle et al., 1996).

Although most of the loss of lean body mass occurs in muscle, virtually all organs participate in this age-related loss of mass, though at varying degrees. On the other hand, the lungs show no loss of weight or, in fact, may show an increase. The liver and kidneys lose one third of their weight between ages 30 and 90 years. An exception to this pattern of loss is the prostrate, which doubles in weight between youth and old age (Kinney, 1982).

Physiological and performance measures generally improve rapidly during childhood and reach a maximum between the late teens and 30 years of age. Functional capacity then declines with age. Although all measures decline with age, not all decline at the same rate. Nerve conduction velocity, for example, declines only 10 to 15% from 30 to 80 years of age, whereas resting cardiac index declines 20 to 30%; maximum breathing capacity at 80 years is about 40% that of a 30 years old. Maximum strength of men and women is generally achieved between the ages of 20 and 30 years. The cumulative effects of aging on central nervous system functions are exhibited by a 37% decline in the number of spinal cord axons, a 10% decline in nerve conduction velocity and a significant loss in the elastic properties of the connective tissue. These changes may partially explain the age-related decrement in neuro-muscular performance as assessed by both
simple and complex reaction and movement times. When reaction time is to consider, the central processing time is affected more than the motor time by the aging process. Thus, aging affects the ability to detect a stimulus and process the information to produce a response (McArdle et al., 1996).

Bone loss seems to be a universal and inevitable consequence of aging. The age of onset of bone loss depends on gender and type of bone. Nearly 90 percent of adult skeletal mass is formed by the end of the teenage years and one's peak bone mass is reached between the age of 30. Around middle age, bone mass begins to gradually decline as aging disrupts the balance between the cells that produce bone and the cells that absorb bone. Women have a more rapid rate of bone loss than men. Most rapid losses occur in the 5 years following menopause. As we age, our muscles generally decrease in strength, endurance, size and weight. Typically, one loses about 23 percent of total muscle mass. One of the most common physical changes that people associate with aging is the wrinkling, pigment alteration and thinning of the skin. The most common changes in the skin include – i) a thinning of the area between the dermis and epidermis by about 20%, ii) elastin and collagen decrease iii) reduction in size of cells and iv) inability of skin to retain moisture. One factor in the aging of the skin is changes in two important fibrous proteins - elastin and collagen, which determine the elasticity and resiliency of the skin. The skin becomes less able to retain fluids and is more easily dry and cracked. As a result, both the thickness and elasticity of skin decrease. (http://www.ageworks.com/information on aging/changes withaging/index.shtml.07.02.2012).

As we age, the heart muscle becomes slightly stiffer and may increase slightly in size. Despite this slight increase in heart size, the amount of blood the chamber can hold may actually decrease because the heart wall thickens. Our blood vessels, including the aorta and other arteries also become stiffer and are less responsive to hormones that relax the blood vessel walls. The stiffening of blood vessels contributes to the increasing systolic blood pressure with aging observed in most cultures. In western countries, systolic blood pressure tends to increase
throughout a person’s life span, while diastolic blood pressure rises until age 60 and then levels off. Our heart rate may be slightly slower as we grow older due to a loss in the number of pacemaker cells. The electrical pathways may develop fibrous tissue and fat deposits that can make dysrhythmia more common. Shifts in the circulation of blood to various organs can also change. The blood flow to the kidneys may decrease by 50 percent and to the brain by 15 to 20 percent. Finally, heart murmurs are more common with age because our heart valves become less flexible and calcium deposits build up (Pugh & Wei, 2001).

Many of the physiological changes with ages may more appropriately be associated with sedentary lifestyle. With the cardiovascular system there is a 20 to 30% decrease in cardiac output by the age 65. Maximal oxygen uptake decreases approximately 9% and 5% per decade, for sedentary men and women respectively (Elia, 1991).

There is a loss in elasticity of the major blood vessels which contributes to a 10 to 40 mmHg elevation in systolic and diastolic blood pressure. Maximum heart rate decreases approximately 10 beats per minute per decade, although resting heart rate shows little alteration with age. The respiratory system undergoes a 40 to 50% loss in forced vital lung capacity by the age 70. There is also a decrease in chest wall compliance, maximum system undergoes a 40% loss of muscle mass and 30% decrease in strength by age 70 (Rogers & Evans, 1993).

1.5.2 Psychological Aspect of Aging

Psychological stress refers to the state of an organism in any solution where he perceives that his well-being endangered and he must devote all his energies to its protection. Psychological stress responses are anxiety, subjective feelings of distress, defensive behaviour, withdrawal and hopelessness. The psychological problems faced by the elderly are complex and numerous. Of these, stress is one, which again becomes manifested in the form of helplessness and hopelessness (Dutta Ray & Chakraborty, 1997).

Three sources account for the increase in major psychological problems, because older people can – (i) become exposed to the stress of poor health due to
their reduced physical and mental functioning, (ii) become exposed to economic stress due to fixed and reduced income with which to meet rising medical expenses and (iii) lose social support because of the death of spouse and friends and disengagements from social life (Harba et al, 1997).

From middle age onward the person confronts changes in the social environment and in his physical body, which require readjustment on his behavioural pattern. Old age is a state of life that increases the likelihood of psychological problems of low self esteem, anxiety and depression. However, these problems can be tempered by the adequacy of the individual's social support. Friends, fellow workers, family and neighbours can ease the burden. But if one is cut off from work (retirement), from children and from spouse (widowhood), the changes of personal trauma increase manifold (Chadha & Khuble, 1997).

Losing mental function is perhaps the most feared aspect of aging. In fact, the fear itself often begins to wear down one's 'quality of life', he begins to believe the stereotype that he is losing (or will lose) his mental function. This can lead to loss of self-esteem and withdrawal from other. However, mental function does not have to decrease with age. These fears are usually groundless. The ability to learn continues throughout life, although one in different ways as he ages. Older people often require more time and effort to absorb new information. One may need to read instructions more carefully to be able to organize and understand new information. As individuals get older, they tend to avoid learning things that are not meaningful or rewarding to them, or that cannot be linked to one of their other senses, such as sight or hearing. Older people may have trouble remembering something, but not others. Short-term memory (< 30 minutes) worsens with aging. Although it is a fact that long term memory (weeks to months) also worsens as one age, this may depend more on getting information into memory, rather than remembering it later. Very long term memory (months to years) is basically permanent, collected through a lifetime of day-to-day education and experience. This type of memory increases from the age of 20 to about the age of 50 and then remains essentially the same until well after 70. (http://www.healthinaging.org/aging in the know/ Chapters Print Ch_trial.asp?ch=3.19.05.2012).
As people grow older, the death of friends and family becomes more common. Loosing and grieving for a spouse is one of the most traumatic situations commonly faced by older adults.

The prevalence of depression is lower in older adults. It can occur from the first time in later life. It is likely to occur following some stressful life events such as loss of a close person or a change in role or can occur without any apparent reason. Some people have a tendency to become depressed throughout their life and this can continue in old age. Risk factors for the development of depression include - female gender, social isolation, widowhood, physical ill health, disability, chronic pain, recent bereavement, a family history of depression and a past history of depression. Prevalence rates of depression in cases of stroke, Parkinson's disease, disability and dementia range upward from 20% (Snowdon, 1997).

Anxiety is a healthy human emotion that is adaptive in certain situations, where it helps one to anticipate, prepare for and react to threatening events. The symptoms of anxiety are multi-dimensional and include cognitive, behavioural and physiological changes. It becomes unhelpful when it occurs in the course of everyday life, and becomes excessive and disabling. When anxiety symptoms reach the point where the persons feel as though they are losing control of their mind or body, this is described as a panic attack. Despite anxiety being one of the most common mental health concerns experienced by older people, it is usually unrecognised by clinicians, which could be due to the fact that anxious older people mostly present with physical complaints, and often anxiety is concomitant with depression (Rosenleaum et al., 1996).

1.5.3 Sociological Aspect of Aging

People's images of old age are often carried from their parents and grandparents, who lived shorter lives in different eras with different demands. People are now living longer, having life potential much preserved and maintained than ever before and the age pyramid of the society is turning upside down (more increased number of aged persons than children), still the views towards aged have
not been changed. Different media are projecting elderly people as stereotyped, intolerant and dependent for a loss of potentiality (Birren, 1996).

In the modern era the social structures and values are deteriorated. Rapid stride in urbanisations and industrialisation leads to the breaking up of joint families and property. This ultimately weakened the so-called traditional familial social position and status of the aged in the family. Learning has become a comparatively quicker process with modern methods of teaching such as books, radio, films and computers. Hence, the aged can no longer necessarily be associated with imparting knowledge and wisdom to the young (Chakraborty, 1997).

Many problems come to the life when old age advances. Daughters departing as a result of wedlock and sons leaving station in pursuit of higher education or a job may make the aged lonelier. It also makes an 'empty nest' feeling in the mind of the aged men. The loneliness also arises because of premature loss of spouse. This would deprive the person of a long standing emotional security. The loss, whenever it might occur in the later years leaves the individual terribly lonely and at the mercy of sons and daughter-in-law. Added to these the increasing gap and interactional stress and strains in the family, that may leave the elderly without peace of mind. The elderly as a result of these developments feel marginalised, alienated and left out of the mainstream. As a person grows old he tends to discourage and withdraw himself from social roles in younger life (Jamuna, 1992).

The basic needs in old age of a person are essentially the same as for an individual of any age. Secure housing, financial security, good health, availability of essential commodities and services, harmonious relationship with family and neighbours and activities that engage an individual with all of the faculties provide a sense of self-worth. The quality of these basic needs is variable and how they will be met differs from culture to culture. In some societies, aged individuals have minimal demands and expectations and these can frequently be meeting within the joint family. In other societies, older individuals have much higher expectations
and demands and these can be met only with the assistance of the broader society. Significant social, demographic and cultural changes, as well as scientific and technical advances are occurring around the world which will substantially affect the aged of today and will affect the aged of tomorrow even more so. How countries divide to use their resources for assuring health care and material security for the elderly is important. Among the developed countries for example, cultural expectations can lead to different actions. Traditionally, Sweden and Japan have had very different social goals regarding the elderly when it comes to living arrangements. In Sweden approximately 7% of the elderly, compared to 65% in Japan live with their children. Sweden’s social policy emphasizes that an independent life is desirable and that older people should live in their own homes. There are many ways in which the Swedish government supports the elderly living on their own, such as having various types of specialized housing and social services. In Japan, pre-war traditions supports the elderly living within their family preferably with the eldest son, and Japanese culture and government has generally stressed that older persons are the family’s responsibility (http://librarythinkquest.org/10120/Cylaer/extended/socialaspect.html.05.09.2012).

India has the second largest number of elderly (60+) in the world as of 2001 census. Today India is the home to one out of every ten senior citizens of the world. Among the total elderly population, those who live in rural areas constitute 78 percent. More than half of the elderly populations are married and among those who are widowed, 64 percent are women as compared to 19 percent of men. Among the old (70+ years) 80 percent are widows compared to 27 percent widowers. Men compared to women are found to be economically more active. Women's economic position depends largely on marital status. Women who are widowed and living alone are found to be the worst among the poor and vulnerable. Inadequate income is a major problem of elderly in India (Siva Raju, 2002). In spite of several economic and social problems, the younger generation generally looks after their elderly relatives. Though, the young generation takes care of their elders in traditional societies, more than 1000 old age homes are run in India (Kujur & Ekka, 2010).
People are now living longer, having fewer children and proportionately shorter work lives. The age pyramid of society is turning upside down and as a result many institutions' assumptions about the society are out of date. Peoples images of old age are often carrying over from their parents and grandparents. Societal views of aging are largely inaccurate and population media projects 'out of date' images of elderly people and their lives. Older audiences get the hand-me-up films and television programmes developed for the young market and tend to adopt stereotyped views of old age and its potentials. As people continue to live longer they develop new way of aging and it is no longer feasible to accept a universal model of aging. Recognising the potential for a full life in late life, society will change in ways that accommodate and serve the aging population. (Birren, 2000)

1.6 Aging and Physical Fitness

Physical fitness describes how ‘fit’ a person physically is to cope with the demands set by his/her environment. For older adults to continue living independently, these demands include activities of daily life and instrumental activities of daily life (Bouchard & Shephard, 1994). Activities of daily life are those that are necessary for self-care, like eating or bathing. Instrumental activities of daily life cover activities necessary for independent liking, like cleaning, cooking or doing groceries (Rosen et al, 1998).

The level of fitness declines with aging. Primary aging is the natural aging process in the body itself, which decreases the physical fitness directly. Secondary aging includes all changes influenced by the primary aging process, such as age-related health conditions and lower activity levels. These changes further reduce physical fitness (Fleg et al, 2005).

Regular physical activity can play a major role in ameliorating many age-related declines in the musculoskeletal and cardiovascular systems (Lampman & Savage, 1988). Furthermore, physical activity often can prevent the need for medical treatment or it can serve as an important adjuvant to medical treatment.
Regular physical activity exerts beneficial effects on the functioning of the cardiorespiratory, vascular, metabolic, endocrine and immune systems. In so doing it greatly reduces risk factors for coronary artery disease, the leading cause of death and may also prevent the development of, or effectively treat diseases such as non-insulin dependent diabetes mellitus, osteoarthritis, osteoporosis, obesity, colon cancer, peripheral vascular occlusive arterial disease, arthritis and hypertension. Regular exercise reduces body fat stores, increases muscle strength and endurance, strengthens bones and importantly improves mental health (USDHHS, 1996).

Aging is associated with profound changes in body composition, muscle strength and muscle mass; often resulting in reduced functional capacity, physical frailty and impaired mobility (Larsson L. et al., 1979; Anionsson et al, 1983, Fiatarone, M.A. Evons, W. J., 1990 and Bendall, M. J. et al. 1989). For example maximum oxygen consumption (VO$_2$ max) declines by 0.40 to 0.45 ml. / kg / min / year (Dehn & Bruce, 1972) and maximum physical work capacity declines by 25% to 30% between the age of 30 and 70 years (Hansford, 1981). Loss of strength in healthy elderly individuals has been estimated at 1.5% per year and loss of power at approximately 3.5% per year (Sidney, 1981).

Older individual who have remained active throughout their lives maintain much of their physical strength, endurance and stamina. Relative to the sedentary elderly, the individual who is habitually active has greater lean body tissue, a lower percentage of body fat and greater bone density. The elderly individual who is physically active is better able to perform activities of daily living and, in general, has a better ‘quality of life’. For older adults with medical problems and physical limitations, exercise programs are particularly important. For such persons, highly individualized physical activity programs should be designed to maximize safety during exercise activities (Lampman, 1997).

There is a decrease in type-II muscle fibers associated with aging, which probably accounts for the dimension of muscle strength (Grimby et al., 1982). Changes in mitochondria structure and distribution are likely to the reasons for loss of oxidative activity (Rowe & Besdine, 1982) and may be a major factor in the
reduced ability of the aged to perform endurance activities. While severe muscle dysfunction and weakness are commonly associated with aging, much of this muscle atrophy may be a normal response to disuse. Exercise training resulting in active skeletal muscle use may attenuate or even reverse this muscle wasting. High intensity resistance training has been shown to improve muscle strength and to reduce fatigue and pain in elderly and physically frail individuals (Fiatarone et al., 1990).

The increasing life expectancies of the last century have been accompanied by decreasing disability rates and improved functional health among the older adults (Manton & Gu, 2007). However, despite this average improvement in health, there are still large disparities in health which have been attributed to disparities in socioeconomic status. For instance, epidemiological research has shown that the socioeconomic status of a person is highly relevant for health (Herd et al., 2011). Consistently it has been that lower socio-economic status is related to worse health (Adler et al., 1994; Mackenbach et al., 2008; Marmot, 2007).

1.7 Physical Fitness and Changing Concept

Physical fitness has three dimensions, which are health-related physical fitness (HRPF), movement-related physical fitness (MRPF) and physiological functional capacity (Lacy and Hastad, 2006).

Health-related physical fitness consists of those components of physical fitness that have a relationship with one’s good health and enhanced performance during execution of motor skill or motor tasks.

The components of HRPF are body composition, cardio-respiratory fitness, flexibility muscular endurance and muscular strength. On the other hand the components of MRPF are agility, balance, co-ordination, power, speed, and reaction time (ACSM, 1998; USDHHS, 2000).

Until 1980, there was no distinction between HRPF and MRPF. Prior to that time, most fitness test batteries had a mix of HRPF and MRPF components. In the
contemporary period, an importance has been felt to physical fitness. One requires an individual’s functional health and physical well-being, that is HRPF and the other measures of motor performance that measures proficiency in motor skills. This dichotomy clearly shows that HRPF is related to functional health and well-being whereas MRPF is related to physical performance and athletic ability. It should be noted that HRPF is foundational to MRPF (Lacy & Hastad, 2006).

HRPF is characterised by those aspects of physical fitness that affect an individual’s functional health and physical well-being. The importance of good eating and activity habits to increase the chances for good health has received much publicity in recent years. Regular aerobic exercise, combined with good nutrition helps prevent hypo-kinetic conditions such as cardiovascular disease, low back pain, obesity and hypertension. The importance of emphasizing these areas strengthens the rational for including it as a separate learning domain (Lacy and Hastad, 2006).

It is becoming an accepted practice for physical fitness testing to emphasize health-related components including body-composition, cardiovascular efficiency, muscular strength-endurance and flexibility of the lower back and posterior thigh areas.

Selected forms of physical activity pertinent to physical education and exercise science are exercise, sports, leisure activities and dance. Physical activity is a process that includes these full categories whereas physical fitness is a product. Physical fitness is a product of physical activity that includes a set of attributes that people have or achieve relating to their maintenance of desired body composition through physical activity (USDHHS, 1996).

Physiological fitness includes non-performance components of physical fitness that relate to biological system that are influenced by one’s level of habitual physical activity (Bouchard, 1990).

Successful aging requires good health, functional autonomy, nutrition, food, recreational facilities, sound economic status and a good support from family and
the society. More so ever, it requires sympathy, love and respect from the near and dear ones. The older population is growing very fast across the globe. Unless and until these enormous masses remain productive to the maximum of their life-span, it will take a heavy toll in the entire development process of a country. Utilizing the experience and wisdom, and with better utilization of the potentialities of the maximum number of the people of a country prosperity may come (Chakraborty, 1997).

1.8 Rationale of the Study

The study was designed to observe the various aspects of aging in relation to performance potentiality and psychological state among the Bengali population. Research related to performance potentiality in the process of aging with multifarious dimensions is limited in numbers in the developed countries and in developing country like ours, it is few and far between. Hence the present study is an attempt to explore the aging issues on performance potentialities and the psychological status of the adults our population.

With these background concepts on different aspects of aging, this study was taken into consideration to understand the performance potentiality and the psychological states of the people of different age groups in our population. Research, related to this area is plenty in number in the developed countries. A few research on various aging issues have been reported by the researchers of our country, particularly from the field of anthropology, psychology and sociology. But a very few references have been obtained on aging issues related to performance potentiality of the adults of our population. Therefore, the present study is a sincere attempt to predict the changes in performance potentiality across the adult life span in Bengali population and their psychological status with advancement of their age.

1.9 Statement of the Problem

The investigation was concerned with performance potentialities of the different adult age groups with respect to their physiological functional capacity, body composition, health-related physical fitness, movement-related physical
fitness and psychological states. Therefore, the research work is stated as "Aging Issues in Relation to Performance Potentiality and Psychological Variables".

1.10 Purpose of the Study

Any human performance is influenced by many identified and unidentified intrinsic and extrinsic factors. The sole purpose of the study was to predict the effects of aging on different aspects of performance potentiality and psychological state of the adults. As the performance potentiality and psychological attributes predicted through different cluster of characteristics, i.e., physiological potentiality, body composition, health-related physical fitness, movement-related physical fitness and psychological variables, the objectives of the study were:

i) To determine and compare physiological potentiality with advancement of age.

ii) To predict and compare the state of body composition with respect to aging.

iii) To determine and compare the health-related physical fitness level with increasing age

iv) To look into the effect of age on movement-related physical fitness.

v) To predict and compare the psychological status of adults with advancement of age.

vi) To determine the changes in different performance potentialities and psychological states of the adults with advancement of age.

vi) To find the relationship among the performance potentiality variables and age.

1.11 Delimitation of the Study

a) In spite of having considerable heterogeneity in the genetic endowment, socio-economic status, diet, habits and culture the study was delimited to the male subjects of the Kandi Sub-division of the District of Murshidabad and the Rampurhat Sub-division of Birbhum District of West Bengal.
b) The aging effects on performance potentialities and psychological variables were understood from the five age groups, that is, 25 – 30 years, 35 – 40 years, 45 – 50 years, 55 – 60 years and 65 – 70 years. Other elderly age groups and the individuals of in between groups did not consider.

c) Aging issues related to performance potentiality was understood through physiological potentialities, body composition, health related physical fitness and movement related physical fitness and psychological status, however the other aspects were not considered in this study.

d) Physiological potentials were measured by resting heart rate, exercise heart rate and systolic and diastolic blood pressure. Other physiological functions were not considered.

e) In body composition, other than percentage body fat, body mass index and waist-to-hip ratio were not considered.

f) Movement-related physical fitness (MRPF) was measured by agility, movement speed, balance and reaction time. The other components of MRPF, i.e., co-ordination and power were not considered.

g) Psychological status of the subjects was measured by trait anxiety, purpose in life and depression. The other psychological aspects were not considered.

h) To minimise the heterogeneity the selected subjects’ family income were not less than Rs. 10,000/- per month and education level - not less than Class-X standard. Individuals not having any chronic clinical problem were considered as the subjects for this study.

i) The subjects were basically sedentary and none of them were engaged in exercise training programme.
1.12 Limitations of the Study

a) The researcher had taken only thirty subjects in each age group from two subdivisions of West Bengal. More subjects for each age group could have yielded more accurate results in terms of the status of the population. But they could not be possible due to paucity of time, money and other resources.

b) To measure human being is of great difficulty. In spite of having sincere effort from the researcher to orient the subjects for the tests, the psychological make-up of the subjects and many environmental conditions were beyond the control of the researcher.

c) All the tests of this study could not be conducted on the same day for the total group and even on the same individual due to reasonable ground.

d) The subjects of the study were selected on the basis of their family income, education level and general health condition. Though the subjects were from both the semi-urban and rural areas, however, locality was not considered as the influencing factor for this study. Besides, urban people and people having other income, education and general health conditions could not be considered in this study.

e) Subjects considered in this study could have suffering from one/many sub-clinical and undiagnosed health problems and they were not excluded from the study which might influence the results of the study.

f) The subjects selected for this study were having no major and/or chronic clinical problems as reported by themselves and the researcher could not arrange any of such screening to detect their general health condition. In addition, their life styles, i.e., food habit, daily life activity levels, etc. were not in selection of the subjects.

g) More sophisticated instruments and modern tests could have yielded more accurate results for this study.
1.13 Definition of Important Terms

**Aging:** The process of change or transformation of the young to the old organism. The term ‘Aging’ refers to the patterns of change that occur with age in genetically representative organisms living under representative environmental conditions.

**Anxiety:** Anxiety encompasses both some degree of activation and unpleasant emotional state. The term anxiety is used to describe the combination of intensity of behaviour and direction of affect or emotion. The direction of affect characteristic of anxiety is negative in that it describes subjective feelings that are unpleasant.

**Depression:** A disorder of mood that involves symptoms of sadness, discouragement and feeling of hopelessness, as well as loss of appetite, difficulty sleeping and loss of energy.

**Gerontology:** The study of the phenomena of aging from a research and scholarly perspective. It embraces studies from the biological, behavioural and social sciences.

**Physiological Potential:** Physiology is the study of functions of the organs of the body. The body tends to maintain its internal environment within a short range. However, due to stress, exercise or some other reasons, the internal environment changes to cope with the demand of the stress. Some parameters are easily observable and changes can be noticed, for example, heart rate, blood pressure, etc. Understanding of these abilities referred to physiological potential in this study.

**Psychological State:** It refers to the general behavioural pattern and psychological make-up of a person. It is the total aggregates of human responses that the people make to both internal and external stimuli. Performance in physical activity is concerned with psychomotor abilities and response capabilities of the individual, which is again dependent on neuro-motor make-up, physical structure and typical level of activation.
Alzheimer’s Disease: It is a disorder which causes mental deterioration in middle or old age. It is characterized by progressive loss of memory and impairment in cognitive functions (language, perception and behaviour), pathological lesions with accompanying massive neuron loss and abundant accumulation of modified proteins.

Balance: Balance may be defined as that physical ability which enables an individual to hold a stationary position.

Blood Pressure: The driving force that moves blood through the circulatory system. Systolic pressure is obtained when blood is ejected into the arteries; diastolic pressure is obtained when the blood drains from the arteries.

Cardiovascular Diseases: Disease associated with heart and blood vessels.

Flexibility: Range of movement in a joint or a sequence of joints.

Heart Rate: The number of ventricular beats per minute is the heart rate. The heart rate is usually determined from pulse rate, which is the number of pressure waves per minute along the carotid artery at the neck or the radial artery at the wrist. The resting value of heart rate for an adult individual is 70–75 beats / minute.

Hypertension: It implies a blood pressure rose above normal

Life Span: Life span is the life duration of an individual organism from the earliest development phase to its death in the adult phase.

Motor Ability: Motor ability is the ability to perform motor skills involving all basic performance traits including hand-eye coordination.

Osteoarthritis: A condition in which joint cartilage decays, causing pain and stiffness
Strength: Strength is the ability to overcome the resistance or to act against resistance.

HRPF: Health related physical fitness (HRPF) is related to some aspect of health. This type of physical fitness is primarily influenced by an individual’s exercise habits; thus, it is a dynamic state and may change. Physical characteristics that constitute health-related physical fitness include strength and endurance of skeletal muscles, joint flexibility, body composition, and cardio-respiratory endurance. All these attributes change in response to appropriate physical conditioning programs, and all are related to health.

MRPF: Movement-related fitness (MRPF) is the ability to perform well in physical activities. To improve the performance in sporting activities such as running, gymnastics etc., one has to work on skill related fitness. MRPF comprises of components such as agility, balance, coordination, power, speed and reaction time. It is the ability to perform efficiently not only in sports but the wide range of daily activities and work-related activities.