CHAPTER II

REVIEW OF RELATED LITERATURE

A careful study and exploration of the selected literature is essential to have insight into work already done within the field. In our country, very little research work has been done as compared to other countries in relation to the field. The scholar has given a deep thinking to those studies and has gained valuable methodological hints from the procedures and findings which were of great importance in the formulation of the research problem. This is a program that has a unique goal of motivating a change in behavior of deaf students by focusing on their participation in physical activity and making it safe, fun, and enjoyable through minor games. A brief review of related studies in the area of psychological and physiological factors and physical fitness were presented in this chapter.

*Psychological Variables*

Garnefski N and Kraaij V (2012) examined the joint influence of cognitive coping strategies and goal adjustment on symptoms of depression and anxiety in people with acquired hearing loss (AHL). The study had a cross-sectional design in which participants were asked to fill in written questionnaires. The sample consisted of 119 individuals with moderate to profound AHL, acquired in adulthood. Symptoms of depression and anxiety, cognitive coping strategies, and goal-related coping processes were assessed. Relationships between these variables were statistically tested by Pearson correlations and multiple regression analyses. The results showed that ruminative and catastrophizing ways of coping were related to the reporting of more symptoms
of depression and anxiety. In contrast, refocusing attention to more pleasant issues, disengaging from unattainable goals, and re-engaging in alternative, meaningful goals were related to the reporting of less symptomatology. These results provide us with important targets for prevention and intervention of mental health problems in people with AHL.

Fellinger J et.al (2009) elucidated factors related to the high rate of mental health disorders seen in those with impaired hearing, including social factors and audio logical measures. A representative sample of 95 pupils (47 females, 48 males; mean age 11y-16y) with hearing impairments of at least 40dB and normal non-verbal intelligence (IQ 97.5, SD 19.5) was assessed audio logically and with a structured clinical interview giving both current and lifetime diagnoses, and the Strengths and Difficulties Questionnaire. Detailed social information was gathered from parents and teachers. Point and lifetime prevalence rates for any psychiatric disorder (32.6%; 45.3%) and depression (7.4%; 26.3%) were higher than in general population samples and not related to the degree of hearing loss. There was a relation between having a lifetime diagnosis and the child's ability to be understood within the family (25.6% vs 7.7%, odds ratio 4.12 [1.2-14.1], p=0.02). Internalizing mental health disorders were between three and six times more likely in those who had been teased, maltreated by classmates, or isolated. We conclude that the increased risk of depression in those who have been teased, isolated, or maltreated is not peculiar to deafness, but the ability to make oneself understood is, and is modestly related (r=0.22-0.34) to the probability of these adverse experiences.
Bradley M. Wipfli’s (2008) research revealed that exercise is effective for reducing symptoms of depression and anxiety. Volunteer student participants (N = 68, Mean age = 21.6 years), who had been sedentary for at least 2-months prior to participating in the study, completed a 7-week exercise program. Participants were randomly assigned to one of two groups: an aerobic exercise group and placebo-control stretching group, which participated in light stretching and yoga exercises three times per week, 30 minutes per session, for all seven weeks. Participants completed several questionnaires, including measures of depression, anxiety, self-esteem, exercise self-efficacy, locus of control, drug and alcohol use, both pre and post-test. Additionally, a small amount of blood was drawn pre and post-test, which was subsequently analyzed for serum serotonin levels. Mixed ANOVA revealed a significant group by time interaction effect for depression, indicating that the aerobic exercise group had lower levels of depression than the placebo-control stretching group after the intervention.

Jones E.G et.al (2007) elucidated in their quasi-experimental, pre-post-test study was to test the effectiveness of the Deaf Heart Health Intervention (DHHI) in increasing self-efficacy for health-related behaviors among culturally deaf adults. The DHHI targets modifiable risk factors for cardiovascular disease. A sample of 84 participants completed time-1 and time-2 data collection. The sign language version of the Self-Rated Abilities Scale for Health Practices (SRAHP) was used to measure self-efficacy for nutrition, psychological well-being/stress management, physical activity/exercise, and responsible health practices. Total self-efficacy scores were significantly higher in the intervention group than in the comparison group at time-2, controlling for scores at baseline (F [1, 81]
= 26.02, p < .001). Results support the development of interventions specifically tailored for culturally deaf adults to increase their self-efficacy for health behaviors.

Kvam M.H et.al (2007) conducted a study Individuals with disabilities encounter practical and social problems beyond those experienced by nondisabled individuals. This extra burden may in turn increase the risk of developing mental health problems. The objective of this study is to disclose the mental health situation among deaf individuals compared to a control sample of hearing individuals. A shortened version of the Hopkins Symptom Checklist was used to disclose the degree of mental distress among the respondents. Three questions common to the studies were analyzed to determine differences between the two groups. Analyses revealed that the deaf respondents showed significantly more symptoms of mental health problems than the hearing respondents. The results point to the need for focusing more attention on the mental health of deaf children and adults. Society must be made aware of the special risks that deaf children and adults encounter with respect to mental health.

Brenes et.al (2007) examined the effects of exercise on depression in a randomized, controlled trial. Thirty-two participants, who had been randomly assigned to an exercise group, a control group, or a medication group, completed the trial. The medication group was prescribed sertraline, a selective serotonin re-uptake inhibitor, while the exercise group completed 60 min aerobic and anaerobic training sessions three times per week for a period of 16 weeks. Results showed that both the medication and exercise groups had significant reductions in depression after the programme, while the control group showed no change.
Jagbir Singh et.al, (2007) had conducted a study to compare differences in competitive anxiety among selected male sports groups, considering a sample consisting of 121 players, of various sports groups, via. Judo, Softball, Handball, Hockey and Basketball, in the inter-collegiate tournaments and assessing the anxiety based on a scale developed by Rainer Martens (1977). ANOVA and Scheffe’s post hoc test were used to analyze the data; and the results showed significant difference in anxiety.

Pawlow and Jones (2005) conducted an experiment on the effects of Progressive Muscle Relaxation (PMR) on 45 experimental and 15 control group subjects. Anxiety was measured using the State Trait Anxiety Inventory (STAI). A pre-test of simple effects indicated that the experimental and control groups did not significantly differ in STAI results (p = .87). However, during post-test the experimental group scored significantly lower on the STAI (p < .001). While these two groups began this experiment with similar anxiety levels, the PMR was effective in drastically reducing anxiety.

Knapen et al (2005) has examined the relationship in an experimental design. Psychiatric patients (N = 199) were randomly assigned to one of two groups: a fitness program consisting of both aerobic exercise and weight training, or a lower intensity fitness program consisting of light physical exercise and relaxation training. Results showed that both groups had increases in self-esteem and self-concept after the 16-week program, accompanied by increases in global self-esteem and decreases in depression and anxiety. These results provide support for the potential role of self concept and self-esteem in the reductions of anxiety and depression following exercise.
Sinanovic O (2004) proposed a study to determine the differences between the anxiety and depression degree in individuals with severe hearing impairments and deaf people in relation to sex and marital status. The sample consisted of 54 subjects, 35 males and 19 females, aged from 18-61 years, with hearing loss greater than 60 dB. We used "SCL-90-R" (Symptom Checklist-90-Revised), to assess the level of anxiety and depression. For the examination of marital stress we used "Stockholm Marital Stress Scale". The results showed that deaf and hard-of-hearing individuals demonstrated certain anxiety and depression levels which correlated significantly with marital status, marital stress, and communication problems. The married deaf subjects showed higher anxiety degree than single one. We determined the statistically significant differences for the anxiety level (p < .03861), age (p < .0006), and communication problems (p < .033) between the married and single deaf people. The females exhibited higher anxiety and depression levels than males, but these differences were not statistically significant. For the prevention of psychological problems in deaf and hard-of-hearing individuals it is necessary to pay attention to their communication problems which are a condition for adequate society integration.

Joshi, B.P (2003) studied the impact of yogic exercise on psychological and physiological variables of college going deaf and dumb students. The student practiced yoga daily for an hour in the morning. By statistical analysis it has been observed that there is a significant relationship between yogic exercise and E.S.R (erythrocyte sedimentation rate), F.V.C (forced vital capacity), hemoglobin, physical and mental health. There was significant effect of yogic exercise on hemoglobin E.S.R and F.V.C of the sample taken.
Eidson T.A (1997) examined 70 hearing-impaired Basketball players participating in a National Basketball tournament by completing Neeman and Harter's Self-perception Profile and examining their feelings of social acceptance, athletic competence, and global self-worth. In addition, players completed the Sport Competition Anxiety Test for trait anxiety and the Competitive State Anxiety Inventory evaluating their cognitive and somatic anxiety as well as their feelings of self-confidence. Correlations indicated an inverse relationship for subjects' ratings of athletic competence with their scores on trait anxiety and rated cognitive and somatic state anxiety. The correlation between rated self-worth and the subjects' feelings of confidence was low and positive. Results are discussed in relation to achievement-motivation theory.

Andersson G and Green M.(1995) examined the association between experiences of hearing impairment and signs of anxiety in 42 elderly hearing impaired patients at a hearing aid centre was investigated. Subjects completed the Hearing Coping Assessment, the Beck Anxiety Inventory, and an audiometric test of hearing. Analysis showed low scores on anxiety and hearing problems compared with other studies. Moreover, scores on anxiety did not correlate with pure tone thresholds for hearing but with self-reported hearing problems ($r = .31$). Anxiety is important, but it is possible that signs of depression are more strongly related to self-perceived hearing handicap.

Wann, J. A. S., & Wann, D. L. (1994) investigated that physical training programme, if based on their physical capacity significantly affects their physiological wellbeing. According to this paper exercises are not given an important place in the curriculum for the special children. Many deaf and dumb people along with other type of handicap people often faces some or other type of psycho-physiological problems and
disorders. As they interact less and they don't take part in external activities, so their body resistance is also vulnerable. So, for deaf and dumb children gradual exercise programme is advocated and with time and capacity these physical activities should be increased to improve their fitness, further. He investigated that physical training programme, if based on their physical capacity significantly affects their physiological wellbeing.

Leigh et.al (1989) evaluated the extent of depressive symptoms among a population of 102 deaf college students and 112 hearing college students. Results suggest 51% percent of the deaf participants were considered to be mildly to moderately depressed compared to 31% of the hearing subjects. For both deaf and hearing groups, findings suggest that low maternal care and high maternal overprotection both were correlated with depressive symptoms. While the vulnerability for mild depressive states was greater for deaf subjects, their rates of serious depression were similar to those of hearing subjects. The research suggests that depressive states are not necessarily associated with deafness but more with the issues related to maternal care.

Topp R (1989) conducted a study was to determine whether test anxiety could be significantly reduced through regular practice of relaxation exercises or physical exercise. Test anxiety was assessed at pre-test and post-test using the 37-item true-false Test Anxiety Questionnaire developed by Sarason. 47 undergraduate students self-selected to participate. The 9 subjects in the group who engaged in a no meditative relaxation exercise 3 times per week for 7 weeks showed a significant decline in test anxiety. The 16 subjects in a supervised aerobic dance class 3 times per week for 7 weeks improved their fitness and their test anxiety significantly declined. The 20 control
subjects did not meet over the 7-week study showed no significant change in test anxiety, fitness, or relaxation.

Bala M. (1985) studied the physically handicapped and normal children with respect to personality traits, health, values, self concept, mental make-up and adjustment and also compared educational facilities provided in schools of normal and handicapped children of age groups of 12-18 years. Major findings for deaf children of this study were, deaf children differ significantly from normal children in personality traits and values. They were reserved, stiff, detached emotionally less stable, submissive, serious, with weak super ego, shy, dependent, withdrawn and apprehensive deaf children were deliberate, inactive, phlegmatic, prudent tender minded and less intelligent. In values, deaf children were less theoretical, aesthetic, religious, economical and more social. Deaf children have poor home and health adjustment and were socially, emotionally and educationally less stable. The facilities (helping aids, trained teachers, necessary physical training and exercises etc.) were quite inadequate as compared to normal schools. This has its implications for all those concerned with handicapped to bring out the need to apply special methods, techniques & exercises for developing personality, values & adjustment and even making them strong physiologically.

Young R.J (1979) investigated the effect of regular exercise on cognitive functioning and personality in 32 subjects representing 4 discrete groups based on gender and age. For a period of 10 weeks that includes jogging, calisthenics, and recreational activities. A test battery was administered to assess morale and life satisfaction (Life Satisfaction and Control Ratings); anxiety and depression. Improvement was observed on several physiological parameters. ANOVA revealed significant sex and age differences
on Digit Symbol and Block Design and age differences on Trail-Making, Crossing-Off, Associate Learning, and anxiety. In addition, an increase on health status rating (p less than .01) and decrease in anxiety were observed from pre to post-test. These data illustrate beneficial effects of exercise on certain measures of cognitive functioning and personality.

**Physiological Variable VO$_2$max**

Ramirez Lechuga J et.al (2012) conducted a study to determine the effect of a high intensity aerobic training program of 8 weeks, developed during physical education classes, on the aerobic capacity of adolescents aged 15 to 18 years. A total of 84 adolescents (51 boys and 33 girls) participated in this study. The sample was divided into 2 experimental groups (G2S and G3S) and 1 control group. The training program was composed of aerobic physical activity (75-80% VO$_2$max). G2S & G3S showed significant improvement than the control group. Furthermore G2S and G3s, girls showed greater improvement than boys.

Tsimaras VK, et.al (2010) conducted a study was to evaluate the effect of a traditional dance training program on aerobic capacity and muscle strength of adults with hearing loss. Twenty-three adults with hearing loss were separated into 2 groups. Thirteen subjects (6 men, 7 women, mean age, 25.7 +/- 3.9 years) constituted the intervention group, whereas 10 subjects (5 men, 5 women, mean age, 26.4 +/- 5.9 years) formed the control group. Pre-training and post-training treadmill tests were performed to determine heart rate (HR peak), peak minute ventilation (VE peak), peak oxygen consumption (VO2 peak, absolute and relative), and time to exhaustion (min). Peak
torque of hamstring and quadriceps muscles at angular velocities of 60 degrees /s, 180 degrees /s, and 300 degrees /s was also measured. The intervention group followed a 12-week traditional dance training program, whereas the control group received no training during this period. Repeated measures of multiple analyses of variance were used to test mean differences between the values of both groups. A paired t-test was used to compare the values within each group prior and after program participation. A significance level of 0.05 was used for all tests. Following the 12-week training program, significant improvements in peak physiological parameters were seen for the intervention group for peak minute ventilation, peak oxygen consumption (both absolute and relative), time to exhaustion, and peak torque values between the 2 measurements (initial and final). No significant improvements in peak physiological parameters and peak torque were noticed in the control group. In conclusion, adults with hearing loss can improve their physical fitness levels with the application of a systematic and well-designed traditional dance training program.

Graef et.al (2009) investigated the effects of a 4-week High Intensity Interval Training (HIIT) program and creatine supplementation on cardio respiratory fitness. Forty-three males were randomly placed in a creatine group (Cr), a placebo group (Pl), or a control group. The Cr and Pl groups completed the same HIIT program, consisting of 5 sets of 2 min of exercise on a bicycle ergometer with 1 min rest intervals between sets. They exercised 5 days a week, with 3 of the 5 days at higher intensities. Exercise intensities ranged from 80 to 120% of VO$_2$max as the training program progressed. The investigators found that the 4-week HIIT protocol significantly increased VO$_2$max and time to exhaustion at VO$_2$max in both the Cr and Pl groups.
Gormley et.al (2008) conducted a study that showed that when the volume of exercise is controlled, higher intensities improve VO₂max more than lower intensities. For this purpose, 55 participants were separated into a moderate (50% VO₂ reserve), vigorous (75% VO₂ reserve), near VO₂max intensity (95% VO₂ reserve) exercise groups and a control group, each group that completed a progressive 6 week training protocol. Each exercise group progressively increased exercise frequency and duration throughout the 6 week training period. All exercise groups significantly increased VO₂max, with greater aerobic improvements in the higher intensity groups than compared to the control group.

Zebrowska A et.al (2007) The objective of the study was to investigate whether a sensory impairment has an effect on functional capabilities of the respiratory system and whether possible deviations from reference ranges of selected parameters might indicate a decrease of physical efficiency. Vital capacity (VC), forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), peak expiratory flow (PEF), forced expiratory flow of 25-75% (FEF25-75), maximum voluntary volume (MVV), and maximum oxygen uptake VO₂max were measured in 86 deaf and 102 blind children and adolescents, and in a matched group of hearing controls. We found a significant influence of deafness on PEF (P<0.01), FEF25-75 (P<0.05), and MVV (P<0.05). As compared with the control subjects, mean VC was significantly lower in blind adolescents (P<0.05). Our results seem to suggest that both sensory defects during childhood and adolescence affect functional capabilities of the respiratory system.

Zebrowska A and Zwierzchowska A (2006) Vital capacity (VC), forced expiratory volume in 1 s (FEV(1)), peak expiratory flow (PEF), mean forced expiratory
flow (FEV(25-75)), and maximum voluntary volume (MVV) were measured in 36 girls and 36 boys with hearing loss and compared with the same number of normal healthy children, all subjects were aged 10-16 years. They participated in an exercise test to calculate VO$_2$max in order to determine their physical efficiency. We found that all Spirometric indices tended to be lower in deaf children, in all age-groups studied and irrespective of gender, compared with their hearing counterparts; the differences assumed significance with respect to PEF and MVV (P<0.05). Moreover, some deaf children had an appreciably lower level of VO$_2$max compared with hearing children. Our results demonstrate that sensory deprivation of deaf children affects functional capabilities of the respiratory system.

Srivastava RD et.al (1998) conducted a study to test the effects of exercise stress on the ECG of the congenitally deaf children from school for deaf, ECG were analysed for the calculation of corrected QT interval (QTc) by Bazett's equation QTc = QT/square root of R-R and also for the evidence for other abnormalities. Both in the normal and deaf children, exercise did not produce significant (P > 0.05) change in QTc from their resting values. However, when pre and post exercise QTc values of deaf children were compared with normal children, the female deaf had significantly longer QTc (P < 0.01) both at rest and after exercise than normal female children. These results lend credence to the hypothesis of sympathetic imbalance and depolarization defects in deaf children's heart, which in more severe form could pass into frank Jervell-Lange Neilsen variant of the Long: QT Syndrome.

Manson J (1994) examined the exercise and noise exposure causes temporary hearing loss. Yet, a direct relationship may exist between cardiovascular
health and hearing. The purpose of this study was to determine whether noise and exercise caused different levels of hearing loss depending on one's cardiovascular fitness. Twenty-eight volunteers were considered: high fit VO2peak = 48.5 +/- 1.6 ml.kg-1.min-1, N = 10), moderately fit VO2peak = 38.1 +/- 0.9 ml.kg-1.min-1, N = 9), and low fit VO2peak = 30.4 +/- 0.9 ml.kg-1.min-1, N = 9). Hearing ability at 2000, 3000, and 4000 Hz was assessed following 10 min of noise (N), exercise (E), and noise-and-exercise (N&E). The high fit group consistently demonstrated better hearing after all conditions compared to the low fit group. Significant differences between the high and low fit groups always occurred during N&E and sometimes during N. E did not cause significant hearing loss in any group. Cardiovascular health as indicated by a mean VO2peak = 48.5 ml.kg-1.min-1 is associated with less hearing loss after 10 min of either N or N&E. Although the mechanisms have not been identified, these results support the existence of a cardiovascular health-hearing synergism.

Thomas et.al, (1984) investigated the effects of multiple training protocols on VO2max in untrained men and women. In this study, 59 people were randomly assigned to one of four exercise groups: a 4 mile continuous run at 75% of HRmax, a 2 mile continuous run at 75% of HRmax, an 8 set interval of a 1 min run at 90% of HRmax followed by 3 min of active rest, and a no exercise control. Each group completed the assigned exercises 3 days a week for 12 weeks; VO2max was measured before and after the 12 week training program. Only the interval group showed a statistically significant improvement in VO2max compared to the control. The authors concluded that a high intensity interval running program can improve cardio respiratory fitness in untrained populations.
Pauly JT et.al (1982) conducted a 14-week study was undertaken to determine the effects of a structured employee exercise program on blood lipid profiles and selected physiological and psychological parameters. Subjects were 73 male and female employees of the Xerox Corporation joining a newly developed health fitness program. In the duration of the study they exercised as often as they chose using activities such as running and cycling to raise heart rates to a target level for 20-minute sessions. Significant improvements overall were found in self-concept (physical, personal and social), trait anxiety, resting heart rate and systolic blood pressure, total triglycerides and total cholesterol. Significant improvements overall and differences among the attendance groups were found in absolute and relative predicted maximum oxygen uptake.

Physical Fitness

Mayorga-Vega D et.al (2012) conducted study to assess the short-term effect of a physical fitness program on physical self-concept and physical fitness elements among primary school students. Spanish boys and girls (N = 75; M age = 11.1 yr., SD = 0.4) were divided into an experimental group and a control group. During physical education classes, the experimental group performed an 8-week program including two circuits of 8 exercises done for 15 to 35 sec. each with 45 to 25 sec. of rest between them. Physical self-concept (Physical Self-Description Questionnaire) and physical fitness (EUROFIT battery tests) were measured at the beginning and at the end of the physical fitness program. The results showed that the improvements in physical fitness were not accompanied by major changes in physical self-concept, even though the physical fitness program seemed to maintain the Experimental group's
previous physical appearance, strength, and self-esteem perceptions, all of which statistically significantly decreased in the control group after the intervention.

Elmahgoub et.al, (2009) found that 15 adolescents with intellectual disabilities who participated in a 10-week combined exercise training program experienced significant decreases in weight, BMI, waist circumference, and fat mass in comparison to the 15 adolescents in the control group. The combined exercise training program consisted of warming up for 5 minutes, cycling for 10 minutes, strength training of the biceps brachia and triceps brachia for 10 minutes, stepping for 10 minutes, strength training of the quadriceps and hamstrings for 10 minutes, and cooling down for 5 minutes. The adolescents in the control group did not receive the 10-week training program, but did participate in the daily school activities, which included physical education classes. This led to a significant p-value of 0.04.

Hartman E et.al, (2007) conducted a study on deaf, the aim of this study was to measure physical fitness of deaf Dutch elementary school children compared with hearing children and to investigate the influence of age on physical fitness. Deaf children were physically less fit than hearing children. Overall, physical fitness increased with age in deaf children, but no significant differences were found between the age groups of 9-10 years and 11-12 years on most of the Euro fit items. The difference in performance between deaf and hearing children, favoring the latter, increased with age in handgrip strength and the 20-m endurance shuttle run. More attention should be paid to developing and maintaining an adequate level of physical fitness in deaf children.
Anand Ezhilarasan (2007) conducted a study on comparison of selected psychological variables and motor fitness components of partially blind and normal students. For the purpose 20 normal children and 20 partially blind children were selected as subjects. Their age ranged from 14-17 years. Static and dynamic balances were only considered as selected motor fitness components. Sports anxiety and sports achievement motivation were the two selected psychological variables. ‘t’ ratio was used to find out the comparison. The result of the study indicated that there was no significant difference between normal and partially blind in sports anxiety and static balance. However significant differences were recorded in achievement motivation and dynamic flexibility.

Viskic et.al. (2007) analyzed the impact of special programmed physical education including dance, aerobics and rhythmic gymnastics on the development of motor and functional abilities and morphological characteristics of female fourth-grade high-schoolers in Zagreb. A total sample of 220 high scholars aged 16-18 years were divided into two groups: experimental group of 115 students attending the program composed of dance structures and aerobics, and control group of 105 students attending classic program of physical education. Two-factor analysis of variance (MANOVA repeated measure design) showed the experimental program to significantly influence the development of coordination/agility and specific rhythm coordination, functional aerobic ability, repetitive and explosive strength and flexibility, along with significant reduction of overweight and adipose tissue. Study results clearly indicate that the existing programs of physical education should be revised and replaced by more appropriate ones.

Burgess et.al (2006) investigated the effects of 6-week aerobic dance on these variables with 50 British schoolgirls aged 13-14 years. A cross-over design was used with
two equivalent groups taught normal physical education and aerobic dance in a different order. The Body Attitude Questionnaire (BAQ) and Children and Youth Physical Self-Perception Profile (CY-PSPP) were administered as pre, mid and post-test to each participant in each group before the first intervention, at the change over and after 12 weeks. The results of this study revealed that participation in 6 weeks of aerobic dance significantly reduced body image dissatisfaction (Attractiveness, Feeling Fat, Salience and Strength and Fitness) and enhanced physical self-perceptions (Body Attractiveness and Physical Self-Worth), although these improvements were not sustained.

Fragala-Pinkham et.al, (2006) conducted a study to investigate the used a single-group pre-test post-test design to study the effects of a community-based fitness program on 28 children with developmental disabilities. The fitness program was held twice a week for 16 weeks and contained a 10-30 minute aerobic conditioning component, in addition to a warm-up, cool-down, and strengthening component. The outcome measures were isometric muscle strength, energy expenditure, functional mobility, and the Presidential Fitness Test. All outcome measures showed statistically significant improvement from baseline.

Wierzbicka-Damska I, et.al (2005) investigation was to estimate on hand of the above the physical efficiency value of hearing impaired children and compare them with healthy counterparts. The investigation covered a group of 63 boys, 27 with hearing impairment (HI) and 36 healthy (R), 10-16 years old. The investigated subjects were divided into 2 groups according to their age: 10-12 and 14-16-year-old boys. For determination of cardio-respiratory system efficiency PWC170 (Physical Working Capacity) test was performed. PWC170 and VO₂max indices were calculated
using proper mathematical equations. The comparison of PWC170 and VO₂max indices shows no statistically significant differences between investigated groups. Boys from younger HI group obtained higher PWC170 and VO₂max values than boys from R group. In older groups, values of investigated indices were inversed in relation to younger groups. Boys from R group obtained higher values of investigated indices. Results received shows some trend, which is probably connected with isolation and absence of cohesion between auditory organ rehabilitation and physical efficiency development.

Lieberman LJ, et.al (2004). conducted a study in twenty-nine deaf children in residential schools were assessed to determine if a significant difference also exists in motor development between deaf children with deaf parents and deaf children with hearing parents. In the loco motor area, 78.6% of deaf children of deaf parents and 73.3% of deaf children of hearing parents reached or surpassed average performance levels. In regard to object control, 92.9% of deaf children of deaf parents and 93.3% of deaf children of hearing parents reached or surpassed average performance levels. The study results show no significant difference between the motor development of deaf children of deaf parents and deaf children of hearing parents.

Tran (2001) studied the effects of hatha yoga practice on the health-related aspects of physical fitness. Ten healthy, untrained volunteers (nine females and one male), selected ranging in age from 18-27 years. The health-related physical fitness variables are muscular strength and endurance, flexibility, cardio respiratory fitness and body composition selected. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50
minutes of asana (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased by 31%, 19%, and 28% respectively, whereas isometric muscular endurance for knee flexion increased 57%. Ankle flexibility, shoulder elevation, trunk extension, and trunk flexion were also increased relatively there was increase in maximal oxygen uptake.

Laybaert and Charlier (1996), conducted a study that revealed when deaf children were exposed to the external society they have good physical health and fitness. Proper exercise programme such as graded exercise, scheduled, under expert instructor help them to get rid of these problems, with gradual functional set-up. They concluded that body composition, respiration and fitness of these children depends upon and is significantly related, with expert guidance and the maximum capacity of their body.

Suzuki M (1991) Heights, weights, and skin-fold thicknesses of 2222 handicapped students aged 3-22 y were measured in the 1984 nutritional survey for handicapped students in Tokyo metropolitan schools for deaf, blind, mentally retarded, and physically handicapped individuals. Although delayed growth was most obvious in physically handicapped students, obesity was already prevalent in many different types of handicapped students, especially those who were mentally handicapped. To estimate daily physical activity, 473 males and 329 females wore a pedometer for 24 hours. There were considerable differences in the mean pedometer scores among the four groups of students: deaf greater than blind = mentally retarded greater than physically handicapped. In the female students who could walk normally, pedometer scores were negatively
related with both body mass index and percent body fat. The nutritional status in the handicapped students is discussed in relation to daily physical activity.

Butterfield, Stephen (1985) investigation was designed to compare and analyze the fundamental motor and balance skill of hearing impaired children through utilization of criterion reference assessment tool. This investigation attempts to ascertain qualitative differences with this population in the skills of walking, running, jumping, throwing, hopping, skipping, staring climb up and balancing. 132 hearing impaired children between the ages of 3 and 14 were selected. Ohio State University Scale of Inter Gross Motor Assessment was used to gather on the children gross motor performance while selected items form Brunininks Oseretsky Test of Motor Proficiency was utilized to obtain information relative to the subject's static and dynamic balance capabilities. Scoring was based on careful observation of child's motor behaviour in performing a skill with companion of that performance which the criterion outlined in the respective test materials. Following and advanced chronological age resulted in improved performance; 2) the other skill walking does not appear to depend on age, at least within the age range investigated in this study. Conclusions were obtained -1) In terms of the fundamental motor skill, both the balance tasks

Susan K. Effegen (1981) conducted a study to Deaf children show subnormal performance on standard tests of static balance. This study investigated the effect of a 10-day exercise program of static balance activities on the static balance ability of severely deaf children. A pre test post test control group design was used. The subjects, 49 deaf children, were tested on a force platform in four different stances. The experimental group then participated in a daily exercise program of activities traditionally used to
facilitate balance ability. A comparison of the change in steadiness scores between the control and experimental groups revealed no significant difference in static balance ability as measured by degree of sway. However, the length of time that children in the experimental group could stand on one leg increased significantly.

Hugh et.al (1976) conducted a study to determine the differences between congenital deaf and hearing children in visual perception and selected motor fitness test items. Congenital deaf students were taken from Louisiana State School for deaf Baton Rouge, Louisiana, and 60 students from Meson Elementary School in Tangipahoa Parish Louisiana, The two experimental groups were measured on visual perception, and selected motor fitness tests items (M.F.T.I) were administered to both the group of children at different times. The findings of the study were 1 multivariable analysis of variance used in this study indicated a significant difference at .01 level between the following variables of two different experimental groups. Visual perception, Static Balance, Dynamic Balance, Agility, Speed, Power, cardio-respiratory Endurance, Kinesthetic Sense, Arm and Shoulder Girdle Strength and Endurance in Congenital Deaf and Hearing children. The analysis also indicated on significant difference between the abdominal strength and speed at .01 levels between congenital deaf and hearing children.

Minter, Martain G (1970) compared deaf and hearing freshman male college students on the variables of reaction time and movement time. Forty deaf male freshmen at Gellandet College Washington D.C. and 50 hearing male freshmen at Catholic University, Washington D.C. who were enrolled in the required physical education programme were tested on two tasks. The first was a simple reaction time test requiring subjects to depress a telegraph key with the index finger when a visual stimulus appeared.
The second was a complex reaction and movement task requiring the subjects to extinguish 10 lights in random sequence. Each subject had 10 trials on each of the two tests. Results of the simple reaction time test showed no significant difference on the reaction movement time test, however, deaf were found superior.

**SUMMARY OF REVIEW OF RELATED LITERATURE**

In this chapter the investigator reviewed a number of studies on Psychological factors: Depression and Anxiety, (ii) Physiological factor: VO₂max and (iii) Physical factors: Cardio-respiratory endurance, Muscular strength, Agility, Explosive power and Speed among different population. The reviews proved that there is further scope to make a study on selected physical, physiological and psychological aspects or variables on deaf students.

Based on the experiences gained through the review of related studies, the investigator selected suitable tools to be administered for selected physical, physiological and psychological variables and formed suitable methodology for the study, which is explained in Chapter III.