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Editor-in-Chief: Prof. (Dr.) S.K. Verma

I am happy that the ***Volume 6, No. 1*** issue of **Journal of Exercise Science and Physiotherapy** ***(JESP)*** is out for the readers. This issue of JESP contains nine articles on diverse important aspects of exercise science. **Venugopal et al from Raipur** studied Temporal Pattern of Circadian Rhythm in Sportsmen and interestingly observed circadian rhythimicity in oral temperature; heart as well as self rating mood and activity all with acrophase between 14.20 and 16.28 hrs. They further reported that oral temperature, mean skin temperature and pulse rate appear to be directly related to room temperature. **Prajakta et al** from Nagpur assessed nutritional status and physical fitness of female swimmers. Their results revealed higher mean intake of fat & protein but lower intake of energy as compared to recommended dietary allowances (RDAs). Cardio respiratory fitness showed negative correlation with energy intake, strongly suggesting need for sufficient energy to carry out sports activities. **Mridha & Banerjee** from West Bengal in their study titled "Effect of One-Year Exercise Programme on Psychological State of Elderly People" concluded that concluded that regular moderate physical exercise can reduce and maintain psychological state of elderly people. **Singh & Singh** from Jalandhar, Punjab reported that *Shaktipat* Meditation was an effective practice to reduce Anxiety. Singh et al from Jalandhar, Punjab in their study on Spiritual Intelligence, Altruism, School Environment and Academic Achievement as predictor of Mental Health of Adolescents revealed that Type of school, Spiritual Intelligence, Altruism, rejection and control (dimensions of School Environment) were the significant predictor of Mental Health; and gender, location of residence, creative stimulation, cognitive encouragement, acceptance, permissiveness and Academic Achievement were not significant predictors of Mental Health. **Shrivastava et al from Raipur** in their study on Personality Dimensions in Sports Performance concluded that the personality dimensions play important role in determining sports performance. **Sharma & Nigam** from Bilaspur, Chattisgarh studied the Relationship between Competitive Performance and Selected Physiological Parameters of Elite Male and Female Gymnasts. The results of their study indicated that both blood pressure and heart rate of elite male and female gymnasts get raised after the performance on competitive apparatus. They further report lack of correlation between competitive performance of both gender and selected physiological parameters. **Multani and Chahal** assessed Bone mineral density (BMD) of 396 individuals and concluded that people who use steroids are at a higher risk of developing osteoporosis rather than Osteopenia. **Verma** from Chandigarh reported a case of eight year old male child who sustained sports injury with fractured upper two central incisors in an angular fashion, involving incisal half of one and incisal third of other. Treatment was carried out by composite build up of the fractured segment by using composite resins. An assessment of the stability and longevity of the restoration, color stability, surface staining were found to be satisfactory and found to be acceptable.

S.K. Verma

Temporal Pattern of Circadian Rhythm in Sportsmen

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Abstract

The present study was undertaken to asses selected time of day effect on different parameters like oral temperature, respiratory rate, finger counting, time estimation, random number adding speed & random adding ratio. The parameters were recorded four times a day i.e. 07.00, 11.00, 15.00 & 19.00 hours for consecutive 4-7 days. Most performance measures were observed to show a natural sway during the solar day in close correspondence with curve in body temperature. Peak in oral temperature recorded at pm hours resembled the peak of respiratory rate that was also recorded at the same time. The detection of circadian rhythimicity in oral temperature; heart as well as self rating mood and activity all with acrophase between 14.20 and 16.28 hrs. It is thought that there are two major rhythms which have relevance for exercise and sports performance. These are the rhythm in body temperature regarded as fundamental variables and sleep-wake cycle by which humans order their work-rest and sleeping schedules.

Key Words: Circadian Rhythm, Oral Temperature, Respiratory Rate, Pulse Rate, Skin Temperature

Introduction

Stability is a rare characteristic of the nature as most living things exhibit fluctuations in their states. These changes may be regular recurring on a cyclical and predictable basis. Clocks are probably ubiquitous in mammalian tissue and circadian rhythms are not completely isolated from other time structure with different periodicities *(Simpson, 1976)*. Circadian rhythms are found at levels ranging from cell division to whole body activity and so may have implications for exercise and sports performance.

There are many potential applications of circadian rhythmicity to exercise. The influence of time of the day on industrial task has been thoroughly researched, yet studies in sporting contexts are not so prolific. In experimental work on exercise, the need to control for time of day when measurements are taken is generally accepted. The potency of many drugs is time of day: dependent though chronopharmocology is a productive area of research its principles have not been carefully examined in treatment of sports injuries. Athletes are creature of habits and so are acutely aware of departure from their usual time of training or competing. The existence of circadian rhythm is most obvious when they are perturbed by loss or disruption of sleep. Crossing time zones causes desynchronization of a multitude of biological rhythms, leading to disorientation until all adjust completely to the new environment,

The present study was undertaken to asses selected time of day effect on different parameters.

Material & Methods

Data was collected four times a day ie 07.00, 11.00, 15.00 & 19.00 hours for consecutive 4-7 days.

Description of variables measured is given below:

Oral Temperature: It was recorded with the help of a clinical thermometer in degree centigrade.

Respiratory Rate: Breathing frequency was measured in one minute, timed by a stopwatch. It was repeated three times and mean was taken.

Finger Counting Speed: The students were instructed to perform this test of eye-hand coordination with the help of a stopwatch. The subject was instructed to hold the stopwatch in left hand, right hand raised and elbow flexed. The subject was further instructed to start the stopwatch and immediately touch right index finger with right thumb and silently count `1', then touch thumb to second finger count `2' and continue these movements and counts to 3rd and 4th fingers and back and forth to fingers 2, 3, 1 and 2, 3, 4 respectively as fast as possible, until the count of 25 is reached. The count of 25 will be completed on index finger, if counting is correct. On 25th count the correctness of the count is checked if wrong the test was repeated until it is counted correctly. Time was recorded.

Time Estimation: The subject was asked to count silently from one to sixty for estimating one minute duration. The stopwatch was started and at the end of count 60, stopwatch was stopped and actual elapsed time was recorded to the nearest 0.1 second.

Random Number Adding Speed: This test was to assess the mental alertness of the subjects using a random number data sheet. 50 random numbers were given in a single column, consecutive pair of numbers to be added as quickly as possible and accurately entering each pair sum between and to the right of the digit.

Random Number Adding Ratio: It is the ratio between right answers of random number adding and time taken for the same. Different variables were self measured by the subjects.

Analysis of Data

Cosinor Rhythmometry: Cosinor rhythmometry by *Nelson et al (1979)* was employed to analyze the data. The data were analyzed individually for each subject as well as for each variable and then for the group.

$$Yt_i = M + A \cos(\omega t_i + \phi) + e_i$$

Yt_i = Value tittled cosine at time t.

M (Mesor) = Rhythm adjusted arithmetic average.

A (Amplitude) = A measure of extent of rhythmic changes eg. the difference between the maximum and the level of sinusoidal function the rhythm. [Half of the differences between the highest and the lowest point of given function]

ω =Angular frequency.

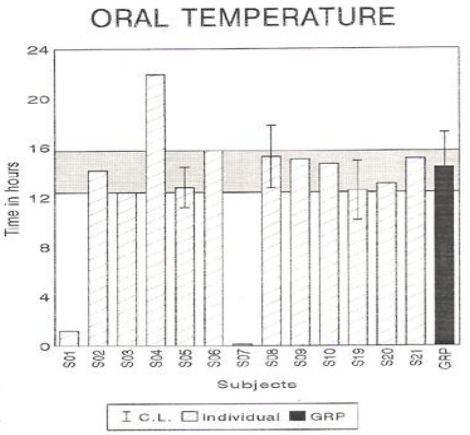
ϕ **(Acrophase)** = A measure of timing the phase at the rest time of the function used to approximate a rhythm (timing of highest value)

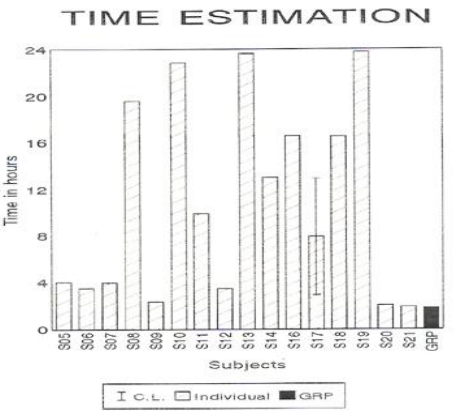
e_i = Time of Sampling.= Uncontrollable random errors assumed to be independent normal deviates with means zero and common variance.

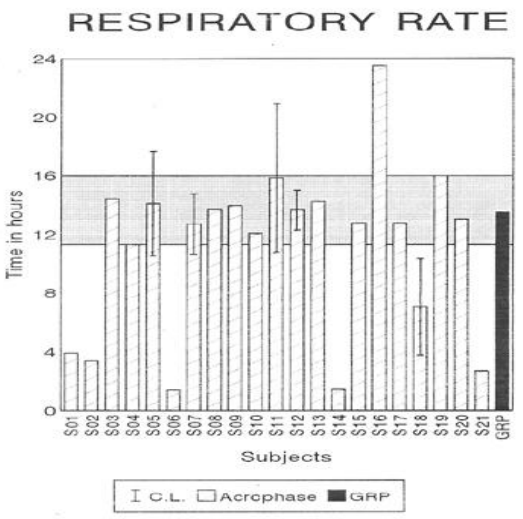
RESULTS

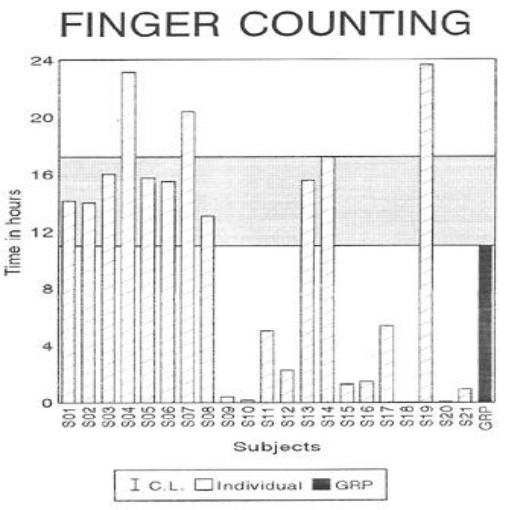
Circadian Mesor: Group circadian mesor recorded for oral temperature was 36.43±0.04 °C, for respiratory rate it was 19.74 ± 0.23 breaths/minute for finger counting it was 07.52t±0.25 seconds, in case of time estimation, random number adding speed & random number adding ratio values recorded 63.54t±1.00 seconds & 59.27t±2.57 seconds & 0.90t±0.01 respectively.

Circadian Amplitude: Data recorded were 0.23(0.07, 0.39), 0.78, 0.72, 4.55 (0.16, 8.92), 02.02, 0.02 for oral temperature, respiratory rate, finger counting, time estimation, random number adding speed & random adding ratio respectively.







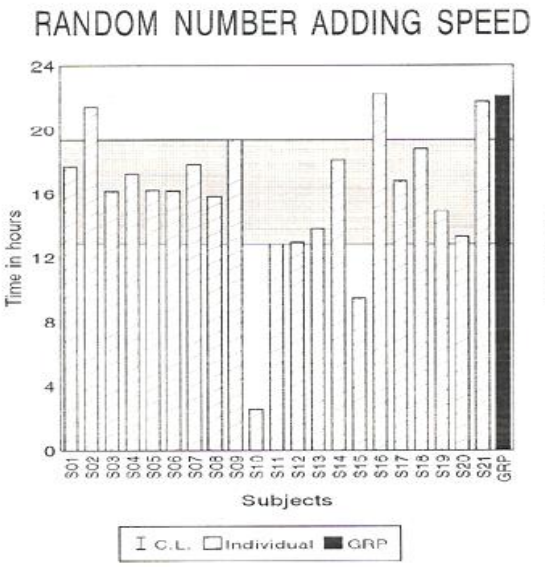


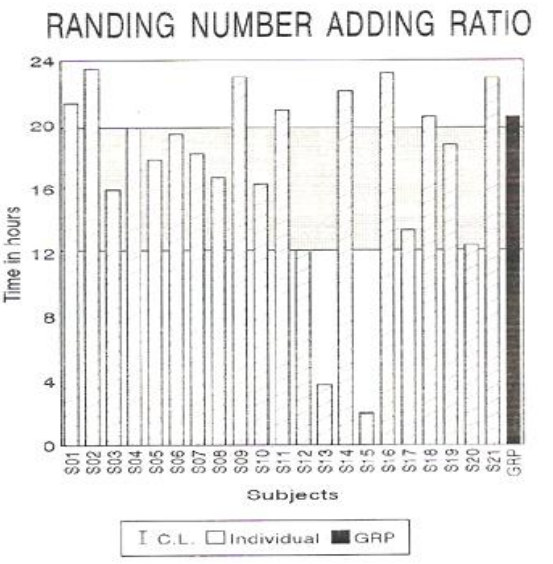
Circadian Acrophase: Circadian Acrophase recorded between 12.38 to 15.72 hrs for most of the subjects whereas group Acrophase for oral temperature was at 14.40 (11.63, 17.17) hours.

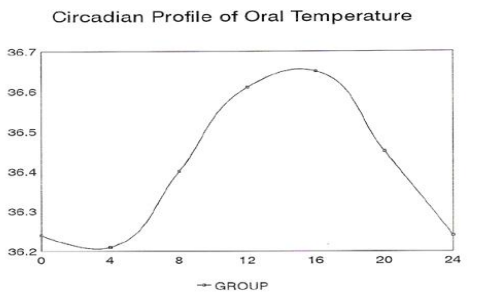
In case of time estimation most of the subjects showed Acrophase at midnight and group Acrophase was 01.74 (20.69, 06.79) hours, which means the closet performance occurred at 16.00 hrs for group data. Acrophase of most of the subjects recorded between 12.95 to 19.38 hrs, whereas group. Acrophase was at 22.06 hours for random number adding speed.

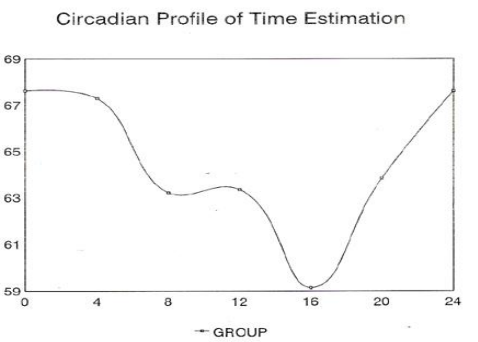
In case of respiratory rate acrophase lied between 11.32 to 16.00 hours whereas group Acrophase noted was at 13.48 hours. In finger counting one group of subjects showed Acrophase

between 13.06 to 20.39 hrs whereas other group exhibited Acrophase between 23.17 to 05.40 hours. Group Acrophase was at 23.01 hours.









Similarly in case of random number adding speed for most of the subjects the Acrophase lied between 12.16 to 19.83 hrs and group Acrophase recorded was 20.46 hrs.

Discussion

As seen in the result that most of the subjects have exhibited in most of the variable Acrophase during the peak in body temperature. Most performance measures tend to show a natural sway during the solar day in close correspondence with curve in body temperature *(Reilly, 1994)*. Peak in oral temperature recorded at PM hours similarly the peak of respiratory rate was also recorded at the same time. The detection of circadian rhythimicity in oral temperature; heart as well as self rating mood and activity all with Acrophase between 14.20 and 16.28 hrs *(Smolensky)*. *Ansorage (1971)* reported that oral temperature, mean skin temperature and pulse rate appear to be directly related to room temperature.

The estimation of time can be considered as an important factor in sports where under estimation or over estimation of time may fill the scale between success

and failure in terms of performance the closet performance of group data was at 16.00 hours, this may be correlated with Acrophase in body temperature. *Rutherford & Willson (1988)* had emphasized the significance of time estimation in general. It has been further discussed that things of rapid responses are crucial and necessary to prevent accidents *(Vercusyssen et al, 1989)*.

It is acknowledged that there is probably a family of clocks organized hierarchically. There are two major rhythms which have relevance for exercise and sports performance. These are the rhythm in body temperature regarded as fundamental variables *(Minors & Waterhouse, 1981)* and sleep-wake cycle by which humans order their work-rest and sleeping schedules. The major clocks, regulating the body temperature and the sleep wake cycles may synchronise the activities of other circadian functions in the manner of non-linear oscillators. Such oscillators are entrained by signals from other timekeepers and there may be many of these operating throughout the organism. Both the major biological clocks and these secondary oscillators enter into consideration when rhythm in exercise performance are examined *(Reilly, 93)*.

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Assessment of Nutritional Status and Physical Fitness of Female Swimmers

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Abstract

The aim of the research study was to assess the nutritional status & physical fitness of 37 young female swimmers, aged 10-14 yrs. Only competitive swimmers engaged in regular practice were chosen. Three day's dietary recall method was used to calculate nutrient intake. Body Fat % (BF %) & Lean Body Mass (LBM) were estimated based on total of skinfold measurements at biceps, triceps, subscapular & suprailiac. Majority of the swimmers met standards of body weight for age & height. BF % of swimmers ranged from 10.72 – 35.53 % (3.71 – 20.03 kg). LBM increased with age (24.52 ± 3.96, 28.20 ± 3.52, 28.74 ± 3.54, 30.99 ± 5.38 & 36.64 ± 7.65 kg for age groups 10+, 11+, 12+, 13+ & 14+ respectively). The results revealed higher mean intake of fat & protein but lower intake of energy as compared to recommended dietary allowances (RDAs). Intake of energy & three major nutrients showed positive correlation with weight indicating positive effect of food consumption on weight gain. Irrespective of age groups, mean intakes of thiamine, riboflavin, niacin, folic acid, vitamin C, calcium, phosphorus & iron of swimmers were found to be more than RDAs. Cardio respiratory fitness showed negative correlation with energy intake (r = -0.12 to -0.38), strongly suggesting need for sufficient energy to carry out sports activities. Majority of swimmers rated above minimum standard of endurance for arm and shoulder & successfully passed flexibility test but showed poor abdominal strength.

KEY WORDS: Nutritional Status, Physical Fitness, Recommended Dietary Allowances (RDAs), Endurance, Cardio Respiratory Fitness, Flexibility

Introduction

Sports are important part of every society, every country, and every part of our planet. In one way or the other, everyone is involved in sport or some sports, whether they are playing or watching or just knows someone who does either. "Sport" activity is integral to all round development of the personality. Achievement in sports has a considerable bearing on the national prestige and morale. India has a rich tradition of sports and physical fitness *(Nath, 1993)*.

Unlike in the past, modern sports are highly competitive, the use of modern equipment, nurturing of talent from a very tender age, stress on hard and physical training along scientific lines and introduction of modern infrastructure and highly sophisticated equipment have changed the very complexion of modern sports. International sports events have become a showcase of nation pride and power *(Debath, 1994)*.

Swimming is a lifetime sports that benefits the body and the whole person. Swimming is said to be a good

exercise for health. It promotes strength, stamina and mobility and improves cardiovascular fitness. There are many benefits- physiological benefits and other indirect benefits. Many swimmers find an indirect benefit from swimming. They develop life skill such as sportsmanship, time management, self-discipline, goal setting. Confidence is developed and an increased sense of self worth through their participation in the sport *(Giridhar, 2006)*.

Body composition, body build, and nutritional status play an important role in sports performance. In fact, such factors seem to dictate the particular sports an individual will be suited for *(Agrawal, 2007)*. Nutrition and exercise physiology share a natural linkage, form the foundation for physical performance; it provides fuel for biological work and chemicals for extracting and using the potential energy within this fuel. Nutrients from food also provide essential elements for repairing existing cells and synthesizing new tissue *(Katch et al., 2001)*. Physical fitness and training are very much dependent on nutritional status of sports personnel. Diet significantly influences the performance of athletes. It is unfortunate to note that many student athletes may not be adequately nourished due to poor understanding of sport nutrition, lack of nutrition knowledge and practice *(Kelkar et al., 2006)*.

Present study was undertaken to assess the nutritional status & physical fitness of female swimmers.

Material and Methods

Selection of Subjects

A total of 37 competitive female swimmers, aged 10 to 14 years were considered for the present study. Players engaged in regular practice & participated in regular sport tournaments were considered. Subjects were subdivided into five age groups, viz. 10+, 11+, 12+, 13+, 14+ years for further analyses (Table1).

Table 1: Age Wise Classification of Subjects (N=37)

SR. NO.	AGE GROUP (YRS)	NUMBER OF SUBJECTS (N)
1	10+	9
2	11+	8
3	12+	8
4	13+	7
5	14+	5

Major areas of the study protocol were: -

- Anthropometric Measurements
- Body Composition
- Dietary Information & Nutrient Intake
  - Biochemical Status
  - Physical Fitness Level

Anthropometric Measurements-

Following measurements were taken:-

- Body weight
- Standing height
- Mid upper arm circumference (MUAC)
- Chest circumference (CHC)
- Waist Circumference (WC)
- Hip circumference (HC)
- Thigh circumference (TC)
- Calf Circumference (CAC)
- Shoulder width (SW)

Measurements were taken using standard procedures *(Sodhi & Sidhu, 1991; Debnath, 1994; Bamji et al., 2005)* & equipments & compared with NCHS/ICMR standards.

Body Composition

Following sites were used to measure skinfold thickness:-

- Biceps
- Triceps
- Subscapular
- Suprailiac

High quality precision skinfold caliper was used for measuring fat folds (Slim Guide: Creative Health Products, Plymouth MICH PATENT PEND). Measurements were taken in triplicate to avoid any errors and mean was calculated and taken as final value.

Body Density *(Durnin & Rahaman, 1967)*, Body Fat (% & kg) *[Siri, 1956]*, and Lean Body Mass (LBM) *[Katch & McArdle, 1983]* were derived based on skinfold measurements at four sites.

Dietary Information

Precise information on food consumption pattern of subjects was gathered through 24-hour dietary recall method for consecutive three days (three day's dietary recall). Data on food habits, meal timings and common dietary pattern was gathered. The intake of nutrients was computed using the values given in the Nutritive Value of the Indian Foods *(Gopalan et al, 2004)*. Nutrient intakes were compared with their respective RDAs.

Blood pressure & pulse rate were recorded with the help of physician.

Physical fitness of each swimmer was assessed using following procedures-

- *Cardio-respiratory Endurance Test*- by Harvard Step Test *(Kansal, 1996).*
- *Arm & Shoulder Strength*- by Bent Knee Sit-Ups *(Margaret, 1986).*
- *Flexibility Strength*- Weber Floor Touch Test *(Margaret, 1986).*
- *Abdominal Strength and Endurance*-for girl's modified push ups (Physical Fitness Pentathlon Event Standard designed by Quaker American Athletic Union (AAU) *(Nelson, 1997).*

Statistical Analysis

Mean, standard deviation, percentage, & range were calculated. Students "t" test was used to derive conclusions from comparisons between various parameters. Correlations between dietary intake, anthropometric measurements, body composition parameters & physical fitness parameters were derived using Pearson's Product Moment Coefficient of Correlation. A level of probability at both 0.05 and 0.01 levels of significance was assumed.

Results

Anthropometric variables are valuable for selection of swimming event. On the basis of anthropometric parameters, coaches can select individual swim stroke based on appearance of young athletes. Measurement of weight and rate of gain in weight are the best parameters for assessing physical growth. Weight in relation to height is considered more important than weight alone. It helps to determine whether a child is within range of "normal" weight for his height *(Sores dos Santos and Riechle, 1999)*. Table 2 shows mean values of height & weight of female swimmers grouped age wise. Female swimmers in

the age groups 10+, 11+ & 12+ were found taller whereas those from age groups 13+ and 14+ were found shorter than the respective standards of height for age (t = 3.61 for 11+ & t = 3.61 for 13+, p<0.01; t = 0.32 – 1.55, p>0.05 for rest of groups). Majority of swimmers were meeting standards of body weight with insignificant differences between actual mean body weight and standards of weight for age and height (t = 0.11 – 2.09, p>0.05). As one grows in height, weight should also increase. High positive correlation between height and weight was derived for all age groups of swimmers (r = 0.58 to 0.92, p<0.01 for 10+, 11+ & 12+ & p>0.05 for 13+ & 14+). Body weight showed positive correlation with intake of energy & three major energy giving nutrients indicating positive effect of food consumption on weight gain (Table 16).

Table 2. Data on Height and Weight of Female Swimmers

Age Group (Yrs)	Height (cm)				Weight (kg)			
	Mean±SD	Range	Std●	"t"	Mean±SD	Range	Std **	"t"
10 +	142.50±5.516	133.00 – 150.00	**138.3**	1.55	32.66±5.297	25.00 – 41.00	**32.5**	0.29
11 +	149.43±5.440	140.00 – 155.00	**142.0**	3.61*	37.38±4.662	28.00 – 45.00	**33.7**	2.09
12 +	148.81±6.642	139.50 – 159.00	**148.0**	0.32	38.93±5.559	33.00 – 51.00	**38.7**	0.11
13 +	148.86±4.580	142.00 – 155.00	**155.0**	3.27 *	44.93±8.640	29.00 – 58.00	**44.0**	0.26
14 +	156.40±7.310	150.00 – 170.00	**159.0**	0.58	48.80±8.424	39.00 – 64.00	**48.0**	0.16

Std - Standard

● - Height for age [NCHS / ICMR Standards, 2004], **- Weight for height [NCHS/ICMR Standards, 2004]

* - shows significant difference at both 0.05 & 0.01 levels (P<0.01), Rest of values show insignificant differences at both 0.05 & 0.01 levels (P>0.05)

Table 3. Statistical derivatives of shoulder width and body circumferences of Female Swimmers

Age Group, yrs	Shoulder Width (cm)		Body Circumferences (cm)											
			MUAC, cm		Chest Circumference, cm		Waist Circumference, cm		Hip Circumference, cm		Thigh Circumference, cm		Calf Circumference, cm	
	M±SD	Range	M±SD	Range	M±SD	Range	M±SD	Range	M±SD	Range	M±SD	Range	M±SD	Range
10 +	32.9±1.5	30–35	20.3±1.6	18–23.0	68.0±5.3	60–79	58.2±8.1	39–69	75.4±5.7	68–84	42.8±4.5	35–49	26.7±1.97	23.5–29.5
11 +	36.5±0.04	33–41	20.4±2.2	17–25	71.9±4.2	63–77	62.3±3.5	57–67	76.6±4.7	69–85	43.1±3.6	37–48	27.9±2.58	23–30
12 +	35.1±0.7	34–36	22.0±1.6	20–25.5	75.5±5.6	69–83	64.2±4.8	58–73	82.2±5.4	76–94	45.3±3.8	40–53	28.5±2.57	25–33
13 +	34.9±2.1	31–38	23.3±2.1	19–26	79.9±8.0	64–90	68.4±4.7	64–77	85.7±5.7	76–94	49.6±4.4	42–57	30.3±2.64	25–33
14 +	37.6±1.2	36–39	23.8±2.7	21–28	83.0±7.9	71–94	73.5±8.1	64–84	89.0±6.7	82–99	48.7±3.9	45–56	27.8±2.80	23–30

Table 3 shows data on shoulder width and body circumferences of swimmers. Swimmers from age group 10+ represented smaller mean shoulder width (32.9 ± 1.49 cm) and those from age group 14+ represented largest mean shoulder width (37.6 ± 1.20 cm) among all groups.

Mean MUAC values show increasing trend for all age groups (20.3 – 23.8 cm). MUAC reflected high positive correlation with body weight (r = 0.73 to 0.94, p<0.01 for 12+ & p>0.05 for rest of groups) & low to medium positive correlation with triceps (r = 0.32 to 0.60, p>0.05) (Table 16).

Mean chest circumference values for age groups 10+, 11+, 12+, 13+ & 14+ were 68.0, 71.9, 75.5, 79.9 and 83.0 cm respectively. Direct relationship was noticed between waist and hip circumference. As age

advanced there found an increasing trend of both waist and hip circumference. However, individual within group variations were noticed as also noticed from range values presented in Table 3. Mean thigh & calf circumference also depicted increasing trend with advancing age. Positive correlations were noticed between body weight & thigh circumference, calf circumference & shoulder width (Table 16).

Table 4: Data on Skinfold Thickness at Biceps, Triceps, Subscapular and Suprailiac of Female Swimmers

Age Group, yrs	Skinfold Thickness Measurements (mm)							
	Biceps		Triceps		Subscapular		Suprailiac	
	M±SD	Range	M±SD	Range	M±SD	Range	M±SD	Range
10 +	10.44±4.59	4.00–19.00	13.44±5.27	5.00–25.00	10.11±3.64	4.00–16.00	13.00±5.54	3.00–20.00
11 +	7.50±4.00	3.00–15.00	10.88±3.06	6.00–17.00	9.38±4.55	5.00–20.00	11.13±3.89	6.00–18.00
12 +	8.19±3.46	4.00–13.50	12.88±2.42	10.00–17.00	10.13±2.20	8.00–14.00	11.63±2.55	8.00–17.00
13 +	13.71±3.53	8.00–19.00	17.29±2.60	13.00–21.00	15.57±5.29	10.00–26.00	16.86±4.29	12.00–24.00
14 +	8.80±3.71	5.00–15.00	15.40±4.59	9.00–23.00	12.40±6.80	5.00–25.00	13.20±6.97	5.00–26.00

Table 4 shows data on skinfold measurement of swimmers. Mean biceps, triceps, subscapular & suprailiac of swimmers ranged between 7.5- 13.71, 10.88- 17.29, 9.38- 15.57 & 11.13- 16.86 mm respectively. Height of swimmers from age groups 10+, 12+ & 13+ showed low to medium positive correlation ($p>0.05$) with triceps, subscapular & suprailiac. Increase in skinfold thickness was noticed with an increase in body weight in majority of swimmers. Subscapular skinfold showed positive correlation with chest circumference ($r = 0.37$ to 0.62, $p>0.05$) (Table 16). Swimmers from age group 13+ showed highest mean skinfolds at all four sites.

Total skinfolds were required for calculation of body density, body fat (BF) and LBM data of which is depicted in Table 5. On the basis of body density, BF (% & kg) was computed which was found to be highest in swimmers from 13+ age group (30.75 % & 13.94 kg). Overall, BF % of swimmers ranged from 10.72 – 35.53 (3.71 – 20.03 kg). In age group 14+, an inverse relationship between body fat content & body weight was observed indicating beneficial effect of sport training ($r = - 0.07$, $p>0.05$) (Table 16).

LBM increased with age (24.52 ± 3.96, 28.20 ± 3.52, 28.74 ±3.54, 30.99 ± 5.38 & 36.64 ± 7.65 kg for age groups 10+, 11+, 12+, 13+ & 14+ respectively). LBM showed high, positive & significant ($p<0.01$) correlation with body weight which indicate increase in muscle mass with gain in body weight (Table 16).

Food habits are influenced by cultural background, religious belief, social norms, and geographical location, availability of particular food items and likes or dislikes. Eating in a regular meal pattern is most important for sports person /athletes because they need intense energy for practice. Irregular meal timings make the food intake less predictable both in the amount of food energy provided and in its nutrient quality.

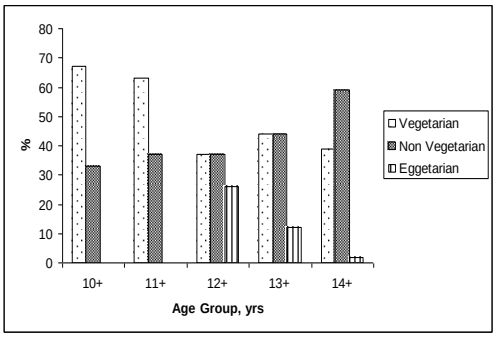

Figure 1: Percentage distribution of female swimmers based on food habits

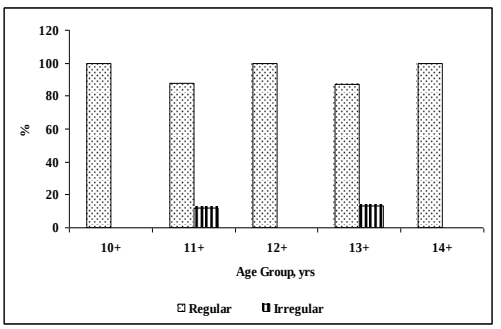

Figure 2: Percentage distribution of female swimmers based on meal timings

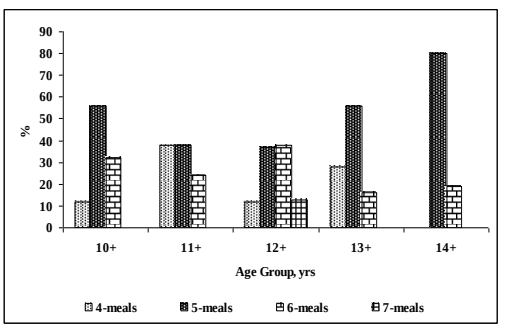

Figure 3: Percentage distribution of female swimmers based on common dietary pattern

Figures 1, 2 and 3 show percentage wise distribution of female swimmers based on food habits, meal timing and common dietary pattern respectively. % of vegetarians was more in swimmers from age groups 10+ & 11+ whereas that of non vegetarians was more in 14+ (Figure 1). 100 % swimmers from age groups 10+, 12+ & 14+ were following regular meal timings (Figure 2). Swimmers found to be following a dietary pattern of 4-5 meals daily (Figure 3).

Table 5: Data on Body Weight, Total Skinfolds and Body Density for Female Swimmers

Age Group (Yrs)	Body Weight, (kg)		Total Skinfolds (mm)		Body Density	
	M±SD	Range	M±SD	Range	M±SD	Range
10 +	32.7±5.3	25–41	47.0± 18.3	16–80	1.04 ± 0.02	1.02– 1.07
11 +	42.7±4.7	28–45	38.9± 13.4	20–65	1.043± 0.009	1.03– 1.06
12 +	38.93±5.6	33–51	42.8± 8.99	31-57	1.04± 0.006	1.03– 1.05
13 +	44.93±8.6	29–58	63.4± 12.9	51–85	1.03± 0.005	1.02– 1.04
14 +	48.8±8.4	39–64	49.8± 21.4	28–89	1.042± 0.018	1.02– 1.07

Table 6: Data on Body Fat and Lean Body Mass for Female Swimmers

Age Group (Yrs)	Body Fat (%)		Body Fat (kg)		Lean Body Mass (kg)	
	M±SD	Range	M±SD	Range	M±SD	Range
10 +	24.6± 7.3	10.7– 33.8	8.15± 3.10	3.71– 12.27	24.52± 3.96	17.86– 31.25
11 +	24.5± 4.0	17.3– 31.3	9.18± 2.07	6.07– 12.20	28.20± 3.52	20.96– 34.26
12 +	26.0± 2.5	22.2– 29.5	10.20± 2.22	7.34– 14.70	28.74± 3.54	25.35– 36.30
13 +	30.8± 2.3	28.4– 35.5	13.94± 3.48	8.55– 20.03	30.99± 5.38	20.46– 37.97
14 +	25.0± 8.1	10.7– 35.1	12.16± 4.26	5.04– 17.55	36.64± 7.650	28.43– 48.96

Table 7: Data on Mean Daily Intake of Energy for Female Swimmers

Age Group (Yrs)	Energy (kcal)			
	M±SD	Range	RDA	"t"
10 +	1851±1978	1599-2317	1907	0.81
11 +	1903±107	1760-2055	1956	1.32
12 +	1894±140	1698-2169	2032	1.17
13 +	1851±163	1588-2076	2037	2.78Δ
14 +	2010±174	1753- 2245	2066	0.51

Table 7: Data on Mean Daily Intake of Energy, Carbohydrate, Fat, and Protein for Female Swimmers

Age Group (Yrs)	Carbohydrate (g)		Fat (g)		RDA	"t" Value
	M±SD	Range	M±SD	Range		
10 +	283±33.32	236- 348	53±9.65	40-74	35	5.38*
11 +	300±31.23	247- 344	49±10.62	23-58	35	3.05*
12 +	301±34.61	256– 352	48±7.94	33–58	32	5.42*
13 +	291± 3.01	226– 350	48±5.08	40–57	32	8.79*
14 +	307±0.89	245– 344	56±7.24	46–66	32	5.45*

Table 7. Data on Mean Daily Intake of dietary fibres for Female Swimmers

Age Group (Yrs)	Fiber (g)	
	M±SD	Range
10 +	16±6.91	13–33
11 +	16±5.03	11–25
12 +	15±6.61	9–30
13 +	16±6.65	10–30
14 +	18±5.20	10–27

∗ - significant difference at both 0.05 & 0.01 levels (p<0.01); Δ - significant difference at 0.05 level but insignificant difference at 0.01 level (0.01<p< 0.05). Rest of the values show insignificant difference at both 0.05 & 0.01 levels (P>0.05).

Table 7. Data on Percentage of Energy Derived From Carbohydrate, Fat and Protein for Female Swimmers

Age Group (Yrs)	% Energy from		
	Carbohydrate	Fat	Protein
10 +	61	26	13
11 +	63	23	14
12 +	64	23	13
13 +	63	23	14
14 +	61	25	14

Table 8. Data on Mean Daily Intake of Carotene & Thiamine

Age Group (Yrs)	Carotene (µg)			Thiamine (mg)		
	M±SD Range	RDA	"t" Value	M±SD Range	RDA	"t"
10 +	794±447.5 *276.6-1872.8*	2400	10.20∗	2.89±1.03 1.46-4.71	0.92	4.14∗
11 +	1676±663 *547- 2874*	2400	1.15	2.45±0.78 1.30-3.42	0.95	4.58∗
12 +	1158±778 *518- 3168*	2400	4.22∗	3.55±2.31 1.34-9.28	0.95	2.77Δ
13 +	1074±1530 *104- 4795*	2400	2.11	3.12±0.94 1.80-4.46	0.93	5.62∗
14 +	650±224 *319- 99*	2400	12.77∗	2.86±1.59 0.77-4.82	1.00	2.90Δ

Table 8. Data on Mean Daily Intake of Riboflavin & Niacine

Age Group (Yrs)	Riboflavin (mg)		Niacin (mg)			
	M±SD Range	RDA	M±SD Range	RDA	M±SD Range	RDA
10 +	1.9±2.2 0.7-7.6	1.11	1.94±2.24 0.7-7.6	1.11	1.9±2.2 0.7-7.6	1.11
11 +	2.3±2.2 0.9-.4	1.14	2.3±2.2 0.9-7.4	1.14	2.3±2.2 0.9-7.4	1.14
12 +	1.7±2.1 0.7-7.4	1.14	1.7±2.1 0.75-7.35	1.14	1.7±2.1 0.8-7.4	1.14
13 +	1.8±2.3 0.4-7.5	1.11	1.8±2.3 0.4-7.5	1.11	1.8±2.3 0.4-7.5	1.11
14 +	2.3±2.6 0.6-7.5	1.21	2.4±2.6 0.6-7.5	1.21	2.3±2.6 0.6-7.4	1.21

Table 8. Data on Mean Daily Intake of Folic acid & Vitamin C.

Age Group (Yrs)	Folic Acid (µg)		Vitamin C (mg)			
	M±SD Range	RDA	M±SD Range	RDA	M±SD Range	RDA
10 +	252.1±72.4 *185.5-445.4*	70	252.1±72.4 *185.5-445.4*	70	252.1±72.4 *185.5-445.4*	70
11 +	321.0±70.2 *206.7-396.4*	70	321.0±70.2 *206.7-396.4*	70	321.0±70.2 *206.7-396.4*	70
12 +	291.0±51.4 *187.3-359.7*	70	291.0±51.4 *187.3-359.7*	70	291.0±51.4 *187.3-59.7*	70
13 +	337.5±116.1 *192.5-489.7*	70	337.5±116.1 *192.5-489.7*	70	337.5±116.1 *192.5-489.7*	70
14 +	242.1±100.5 *81.3-383.5*	70	242.1±100.5 *81.3-383.5*	70	242.1±100.5 *81.3-383.5*	70

∗ - significant difference at both 0.05 & 0.01 levels (P<0.01); Δ - significant difference at 0.05 level but insignificant difference at 0.01level (0.01< P < 0.05). Rest of the values show insignificant difference at both 0.05 & 0.01 levels (P>0.05).
Numbers in Italic in M ± SD column show Range.

Table 9. Data on Mean Daily Intake of Minerals (Calcium & Phosphorus) for Female Swimmers

Age Group (Yrs)	Calcium (mg)			Phosphorus (mg)		
	M±SD Range	RDA	"t"	M±SD Range	RDA	"t"
10 +	682±141 *465- 878*	600	1.84	1533±169 391-1776	600	15.71∗
11 +	824±96 *695-008*	600	6.17∗	1702±224 138-1988	600	13.01∗
12 +	903±308 *56-1497*	600	2.60Δ	1542±381 846-2117	600	6.53∗
13 +	631±193 *415- 901*	600	0.38	1593±396 1007-2334	600	6.10∗
14 +	845±363 *342-1231*	600	1.10	2004±326 1533-2405	600	7.02∗

∗ - significant difference at both 0.05 & 0.01 levels (P<0.01); Δ - Shows significant difference at 0.05 level but insignificant difference at 0.01level (0.01< P < 0.05). Rest of the values show insignificant difference at both 0.05 & 0.01 levels (P>0.05).
Numbers in Italic in M ± SD column show Range.
Mg-Magnesium; Na-Sodium; K-Potassium

Table 10. Data on Approximate Mean Daily Intake of Water for Female Swimmers

Age Group (Yrs)	Approximate Daily Water Intake (Glasses)	
	M ± SD	Range
10 +	13 ± 2.15	10 - 16
11 +	13 ± 2.05	10 - 16
12 +	12 ± 1.85	10 - 16
13 +	15 ± 2.56	12 - 20
14 +	13 ± 2.04	10 - 16

Table 11. Data on Mean Systolic Blood Pressure (SBP)

Age Group (Yrs)	SBP (mm / Hg)			
	M ± SD	Range	Std *	"t"
10 +	116±4.969	110 -120	120	2.54 Δ
11 +	113±4.841	110 -120	120	3.11 *
12 +	116±4.841	110 -120	120	2.05 #
13 +	116±4.949	110 -120	120	2.11 #
14 +	114±4.899	110 -120	120	2 #

Table 11. Data on Mean Diastolic Blood Pressure (DBP)

Age Group (Yrs)	SBP (mm / Hg)			
	M ± SD	Range	Std *	"t"
10 +	76±4.969	70 - 80	80	76±4.969
11 +	77±5.000	70 -80	80	77±5.000
12 +	75±5.000	70 - 80	80	75±5.000
13 +	76±4.949	70 - 80	80	76±4.949
14 +	74±4.899	70 - 80	80	74±4.899

Table 11. Data on Mean Pulse Rate

Age Group (Yrs)	Pulse Rate (beats|min)			
	M ± SD	Range	Std *	"t"
10 +	78±5.877	69 - 86	72	2.84 Δ
11 +	82±6.556	70 - 88	72	4.15 *
12 +	76±4.484	70 - 82	72	2.43 Δ
13 +	77±6.782	62 - 84	72	1.79 #
14 +	76±2.227	72 - 79	72	2.79 Δ

SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; Std – Standard;*-"Nutrition" – Quarterly Publication (NIN, 2000). Vol.34 (4): 15.
- Insignificant difference at both 0.05 & 0.01 levels (P>0.05); * - significant difference at both 0.05 & 0.01 levels (P<0.01); Δ - Shows significant difference at 0.05 level but insignificant difference at 0.01 level (0.01< P < 0.05).

Table 12. Percentage Wise Distribution of Female Swimmers Based On Cardio Respiratory Fitness

Age Group (Yrs)	CARDIO RESPIRATORY FITNESS PROFILE OF SUBJECTS				
	Excellent	Very Good	Good	Fair	Poor
	%	%	%	%	%
10 +	-	-	55.56	-	44.44
11 +	-	--	75	-	25
12 +	37.5	12.5	37.5	-	12.5
13 +	-	28.57	28.57	-	42.86
14 +	40	20	-	-	40

Table 13. Percentage Wise Distribution of Female Swimmers Based on Arm & Shoulder Endurance

Age Group (Yrs)	RATING FOR ENDURANCE OF ARM & SHOULDER					
	Below Minimum Standard		Minimum Standard		Above Minimum Standard	
	No	%	No	%	No	%
10	4	44.44	-	-	5	55.56
11	3	37.5	-	-	5	62.5
12	-	-	1	12.5	7	87.5
13 +	5	71.42	1	14.29	1	14.29
14 +	2	40	-	-	3	60

Anthropometric variables are valuable for selection of swimming event. On the basis of anthropometric parameters, coaches can select individual swim stroke based on appearance of young athletes. Measurement of weight and rate of gain in weight are the best parameters for assessing physical growth. Weight in relation to height is considered more important than weight alone. It helps to determine whether a child is within range of "normal" weight for his height *(Sores dos Santos and Riechle, 1999).* Table 2 shows mean values of height & weight of female swimmers grouped age wise. Female swimmers in the age groups 10+, 11+ & 12+ were found taller whereas those from age groups 13+ and 14+ were found shorter than the respective standards of height for age ($t = 3.61$ for 11+ & $t = 3.61$ for 13+, $p<0.01$; $t = 0.32 – 1.55$, $p>0.05$ for rest of groups). Majority of swimmers were meeting standards of body weight with insignificant differences between actual mean body weight and standards of weight for age and height ($t = 0.11 – 2.09$, $p>0.05$). As one grows in height weight should also increase. High positive correlation between height and weight was derived for all age groups of swimmers ($r = 0.58$ to 0.92, $p<0.01$ for 10+, 11+ & 12+ & $p>0.05$ for 13+ & 14+). Body weight showed positive correlation with intake of energy & three

major energy giving nutrients indicating positive effect of food consumption on weight gain (Table 16).

Table 14. Percentage Wise Distribution of Female Swimmers Based On Abdominal Strength & Endurance

Age Group (Yrs)	PERCENTILE FOR ABDOMINAL STRENGTH & ENDURANCE									
	90 %	80 %	75 %	60 %	50 %	40 %	30 %	25 %	20 %	10 %
10 +	-	-	-	11.11	-	22.22	-	-	-	66.67
11 +	-	12.5	-	12.5	12.5	12.5	-	-	12.5	37.5
12 +	37.5	12.5	12.5	12.5	25	-	-	-	-	-
13 +	-	14.28	-	14.28	-	14.28	14.28	28.6	-	14.28
14 +	20	40	-	-	-	20	-	-	-	20

Table 15. Percentage Wise Distribution of Female Swimmers Based on Flexibility Test Results

Sr. No.	Age Group (Yrs)	FLEXIBILITY TEST RESULTS			
		Pass		Fail	
		No	%	No	%
1	10 + (n = 9)	8	88.88	1	11.12
2	11 + (n = 8)	7	87.5	1	12.5
3	12 + (n = 8)	6	75	2	25
4	13 + (n = 7)	5	71.43	2	28.57
5	14 + (n = 5)	5	100	-	-

Table 3 shows data on shoulder width and body circumferences of swimmers. Swimmers from age group 10+ represented smaller mean shoulder width (32.9 ± 1.49 cm) and those from age group 14+ represented largest mean shoulder width (37.6 ± 1.20 cm) among all groups.

Mean MUAC values show increasing trend for all age groups (20.3 – 23.8 cm). MUAC reflected high positive correlation with body weight ($r = 0.73$ to 0.94, $p<0.01$ for 12+ & $p>0.05$ for rest of groups) & low to medium positive correlation with triceps ($r = 0.32$ to 0.60, $p>0.05$) (Table 16).

Mean chest circumference values for age groups 10+, 11+, 12+, 13+ & 14+ were 68.0, 71.9, 75.5, 79.9 and 83.0 cm respectively. Direct relationship was noticed between waist and hip circumference. As age advanced there found an increasing trend of both waist and hip circumference. However, individual within group variations were noticed as also noticed from range values presented in Table 3. Mean thigh & calf circumference also depicted increasing trend with advancing age. Positive correlations were noticed between body weight & thigh circumference, calf circumference & shoulder width (Table 16).

Table 4 shows data on skinfold measurement of swimmers. Mean biceps, triceps, subscapular & suprailiac of swimmers ranged between 7.5- 13.71, 10.88- 17.29, 9.38- 15.57 & 11.13- 16.86 mm respectively. Height of swimmers from age groups 10+, 12+ & 13+ showed low to medium positive correlation ($p>0.05$) with triceps, subscapular & suprailiac. Increase in skinfold thickness was noticed with an increase in body weight in majority of swimmers. Subscapular skinfold showed positive correlation with chest circumference ($r = 0.37$ to 0.62, $p>0.05$) (Table 16). Swimmers from age group 13+ showed highest mean skinfolds at all four sites.

Total skinfolds were required for calculation of body density, body fat (BF) and LBM data of which is depicted in Table 5. On the basis of body density, BF (% & kg) was computed which was found to be highest in swimmers from 13+ age group (30.75 % & 13.94 kg). Overall, BF % of swimmers ranged from 10.72 – 35.53 (3.71 – 20.03 kg). In age group 14+, an inverse relationship between body fat content & body weight was observed indicating beneficial effect of sport training ($r = - 0.07$, $p>0.05$) (Table 16).

LBM increased with age (24.52 ± 3.96, 28.20 ± 3.52, 28.74 ±3.54, 30.99 ± 5.38 & 36.64 ± 7.65 kg for age groups 10+, 11+, 12+, 13+ & 14+ respectively). LBM showed high, positive & significant ($p<0.01$) correlation with body weight which indicate increase in muscle mass with gain in body weight (Table 16).

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Table 6 depicts data on mean daily intake of energy, carbohydrate, fat, protein and fiber. All four age groups of swimmers showed mean daily energy intake less than RDAs. Difference was significant difference at 0.05 level but insignificant difference at 0.01 level ($t = 2.78$, $0.01<p<0.05$) for 13+ age group while rests of the groups showed insignificant differences ($t = 0.51$-1.17, $p>0.05$). Range values reflected individual variations with energy between 1588-1317 kcal (Table 6).

Mean carbohydrate intake of swimmers ranged between 236-348, 247-344, 256-352, 226-350 & 245-344 g with means of 283, 300, 301, 291 & 307 g for age groups 10+, 11+, 12+, 13+ & 14+ respectively. Mean fat and protein intake of swimmers from all age groups was found to exceed than their RDAs. Differences between fat intake and RDAs were highly significant for ($t = 3.05$-8.79, $p<0.01$). Fat is a concentrated source of energy & could lead to fat deposition in the body. Here, in the present study, fat intake reflected positive correlation with body fat content with significant difference in 14+ age group ($r = 0.09$ to 0.98) (Table 16). Differences between protein intake and RDAs were insignificant for ($t = 0.43$-1.86, $p>0.05$). Mean protein intake ranged between 60±3.68 to 69±7.15 g & showed positive correlation with development of LBM ($r = 0.08$ to 0.62, $p>0.05$) indicating need of sufficient amount of protein in daily diet (Table 16).

Percentage energy derived from three major nutrients was 61-64, 23-26 & 13-14 % for carbohydrate, fat & protein respectively (Table 7).

No major differences were seen for mean fiber intake of swimmers which was 15-18g/day (Table 6).

Table 8 represents data on mean daily intake of vitamins. Irrespective of age group, mean intakes of thiamine, riboflavin, niacin & folic acid among swimmers were found to be more than RDAs. Differences were insignificant for all age groups for riboflavin and niacin intake ($t = 0.68$-1.36 for riboflavin & $t = 0.81$-1.39 for niacin; $p>0.05$) and significant for thiamine & folic acid intake ($t = 2.77$-5.62 for thiamine & $t = 2.31$-11.39 for folic acid; $p<0.01$). The B vitamins are of special interest to athletes and exercisers because they govern the energy producing reactions of metabolism. Vitamin needs are increased because of the high rates of growth *(Smolin, 1997, Houtkooper et al., 1998)*. *Manore & Thompson (2000)* studied the effect of physical activity on thiamine, riboflavin & vitamin B-6 requirements. Because exercise stresses metabolic pathways that depend on thiamine, riboflavin, & vitamin B-6 the requirements for these vitamins may be increased in athletes & active individuals.

The antioxidant vitamins – such as vitamin A, C & beta-carotene– play an important role in protecting the cell membrane from oxidative damage. Exercise can increase the oxidative processes in the muscle, leading to increased generation of lipid peroxides & free radicals *(Keith, 1994)*. In the present study, irrespective of age, mean daily intake of carotene of swimmers was found to be significantly less than RDAs. Differences were highly significant ($p<0.01$) for swimmers from age groups 10+ ($t = 10.20$), 12+ ($t = 4.22$) & 14+ ($t = 12.77$) and insignificant ($p>0.05$) for swimmers from age groups 11+ ($t = 1.15$) & 13+ ($t = 2.11$). Low carotene intake may be due wrong food choices or may be due likes or dislikes of carotene rich foods such as green leafy vegetables, yellow fruits and vegetables which was observed in the swimmers. In contrast to intake of carotene, mean intake of vitamin C of swimmers from age groups 11+, & 12+ was found to be highly exceeding their respective RDAs ($t = 4.96$ & 3.42 respectively, $p<0.01$). Higher intake of vitamin C in all age groups could be attributed to inclusion of higher amount of seasonal fruits & vegetables rich in vitamin C (Table 8).

Table 9 demonstrates mean daily intakes of minerals for swimmers. Mean intake of both calcium & phosphorus in female swimmers from all age groups was observed to be more than their respective RDAs ($t = 0.38$-6.17; differences were significant at $p<0.01$ for 11+ & at $0.01< p < 0.05$ for 12+ & insignificant at $p>0.05$ for 10+, 13+ & 14+ for calcium & $t = 6.10$-15.71; differences were very highly significant at $p<0.01$ for swimmers from all age groups for phosphorus). Calcium: phosphorus ratio was derived & a range of 0.40 to 0.59 among swimmers.

Mean iron intake for swimmers from all age groups was found to be insignificantly more than their respective RDAs for age groups 10+, 11+ & 13+ ($t = 1.73$, 1.62 & 1.59, respectively, $p>0.05$). With advancing age, swimmers were unable to meet their requirement for iron ($t = 1.31$ & 1.53, $p>0.05$ for age groups 13+ & 14+) (Table 9). A combination of factors increases athlete's chances of depleting his or her iron stores. Inadequate dietary intakes of iron-rich foods combined with iron losses aggravated by physical activity

compromise iron status. Physical activity may cause increased iron losses in sweat, feces and urine, plus increased destruction of red blood cells that occurs during exercise *(Boyle, 2000).*

Mean daily total sodium & potassium intake among swimmers was found to be in the range of 1920-2304 mg & 2261-3788 mg respectively. Total sodium indicates sodium from food stuffs & sodium from salt. Magnesium intake of swimmers ranged from 389 to 516 mg. all age groups of swimmers showed significantly less mean intake of zinc as compared to RDAs ($t = 3.47\text{-}11.10$, $p<0.01$) (Table 9).

Table 10 depicts approximate mean daily intake of water by swimmers. Swimmers drank approximately 12.0 ± 1.85 to 15.0 ± 2.56 glasses of water daily. Water is the nutrient most critical to athletic performance. Without adequate water, performance can suffer in less than an hour. Water is necessary for the body's cooling system. It also transports nutrients throughout the tissues and maintains adequate blood volume. During exercise there is always the risk of becoming dehydrated (fluid volume deficit), especially when the temperature is hot. When athletes sweat, they lose water *(Williams, 1990; Grodner et al., 1996; Paquot, 2001).*

A physically fit heart beats at a lower rate and pumps more blood per beat at rest. Regular endurance exercise results in an increased capacity to use oxygen, leading to the ability for more physical work *(Strauss and Richard, 1984).* Table 11 presents data on blood pressure & pulse rate of swimmers. Mean systolic blood pressure (SBP) & diastolic blood pressure (DBP) of swimmers from all age groups was found to be less than the standards. Mean pulse rate value of swimmers from all age groups was found to be more than the normal value of 72. The mean heart rate & blood pressure of the selected athletes studied by *Chandrashekhar et al., (1988)* was found to be less than the normal values of 72 beats / min & 120 / 80 mmHg respectively.

Fitness involves cardio respiratory endurance, muscle strength and endurance, flexibility and desirable body composition. These components of fitness are important for athletes but also extend to every aspect and task of daily life *(Strauss and Richard, 1984).* Data on cardio respiratory fitness, arm & shoulder endurance, abdominal strength & endurance and flexibility test results of female swimmers are showed in Tables 12, 13, 14 and 15 respectively.

Assessing cardiovascular fitness encompasses testing the ability of the respiratory, cardiovascular, and skeletal muscle tissue to take in deliver, and utilize oxygen while performing prolong exercise of moderate to high intensity *(Manore et al., 2000 & Manore & Thompson, 2000).* For the present study, 40 & 37.5 % swimmers from age groups 14+ & 12+ rated "excellent" for their cardio respiratory fitness. 12.5, 28.57 & 20 % swimmers from age groups 12+, 13+ & 14+ showed very good cardio respiratory profile whereas 55.56, 75, 37.5, & 28.57 % swimmers from age groups 10+, 11+, 12+ & 13+ respectively rated "good" for their cardio respiratory fitness. The highest percentage value for poor cardio respiratory fitness was found in 10 + age group of female swimmers (44.44 %) which might be because of slower pace of swimming, overall intensity, duration, motivation and overall

health status of swimmers (Table 12). Swimmers were unable to meet their energy demands (Table 6) which had a deleterious influence on their cardio respiratory fitness. Cardio respiratory fitness correlated negatively with energy intake (r = -0.38, -0.12, -0.18 & -0.21 for 11+, 12+, 13+ & 14+ age groups, respectively) strongly suggesting need for sufficient energy to carry out sports activities (Table 16).

Table 16. Coefficient of Correlation between Various Anthropometric Measurements, Body Composition, Nutrient Intake and Physical Fitness Profile of Female Swimmers

Sr. No.	PARAMETERS	AGE GROUP (YEARS) 10 + (n = 9)	11 + (n = 8)	12 + (n = 8)	13 + (n = 7)	14 + (n = 5)
1	Height Vs. Weight	0.90●	0.92●	0.85●	0.58	0.82
2	Height Vs. MUAC	0.51	0.47	0.83*	0.31	0.75
3	Height Vs. Triceps	0.35	-0.11	0.47	0.39	-0.47
4	Height Vs. Subscapular	0.53	-0.33	0.42	0.67	0.03
5	Height Vs. Suprailiac	0.43	-0.36	0.30	0.56	0.02
6	Height Vs. Total Skinfolds	0.45	-0.36	0.39	0.73	-0.16
7	Height Vs. LBM	0.73*	0.53	0.89●	0.48	0.61
8	Height Vs. BF Content	0.27	-0.34	0.30	0.74	0.15
9	Weight Vs. MUAC	0.73*	0.70*	0.90●	0.78*	0.94*
10	Weight Vs. Shoulder Width	0.67*	0.62	0.40	0.77*	0.61
11	Weight Vs. Thigh Circumference	0.71*	0.48	0.73*	0.93●	0.34
12	Weight Vs. Calf Circumference	0.37	-0.2	0.82*	0.95●	0.17
13	Weight Vs. Biceps	0.54	0.43	0.67	0.16	-0.33
14	Weight Vs. Triceps	0.36	0.57	0.78*	0.27	-0.47
15	Weight Vs. Subscapular	0.61	-0.00	0.64	0.60	0.08
16	Weight Vs. Suprailiac	0.55	-0.18	-0.10	0.87*	-0.02
17	Weight Vs. Total Skinfolds	0.52	-0.18	0.60	0.63	-0.16
18	Weight Vs. LBM	0.81●	0.90●	0.98●	0.98●	0.86
19	Weight Vs. BF Content	0.31	0.21	0.62	0.61	-0.07
20	MUAC Vs. Biceps	0.69*	0.44	0.48	-0.22	0.01
21	MUAC Vs. Triceps	0.51	0.50	0.60	0.32	-0.16
22	Chest Circumference Vs. Subscapular	0.37	-0.11	0.62	0.55	0.37
23	Waist Circumference Vs. Suprailiac	0.07	-0.20	0.45	0.87*	0.67
24	Carbohydrate Vs. Weight	0.20	0.04	0.40	0.53	-0.64
25	Carbohydrate Vs. LBM	0.10	-0.17	0.43	0.49	-0.21
26	Carbohydrate Vs. BF Content	0.21	0.37	0.33	0.55	-0.39
27	Fat Vs. Weight	0.26	0.31	-0.36	0.12	0.44
28	Fat Vs. LBM	0.42	0.30	-0.38	-0.52	-0.06
29	Fat Vs. BF Content	0.09	0.18	0.30	0.71	0.98*
30	Protein Vs. Weight	-0.07	0.01	0.67	0.63	-0.45
31	Protein Vs. LBM	0.08	0.11	0.62	0.58	0.27
32	Protein Vs. BF Content	-0.03	-0.16	0.70*	0.66	-0.41
33	Energy Vs. Weight	0.24	0.33	0.39	0.44	-0.51
34	Energy Vs. LBM	0.25	0.11	0.39	0.43	-0.53
35	Energy Vs. BF Content	0.10	0.55	0.36	0.44	-0.07
36	Energy Vs Cardio Respiratory Fitness	0.13	-0.38	-0.12	-0.18	-0.21
37	Iron Vs Cardio Respiratory Fitness	-0.38	-0.35	-0.32	-0.21	-0.13
38	Energy Vs Abdominal Strength & Endurance	0.04	-0.15	0.76*	0.37	-0.63
39	Carbohydrate Vs Abdominal Strength & Endurance	-0.11	-0.31	0.51	0.25	-0.65
40	Fat Vs Abdominal Strength & Endurance	0.07	0.38	0.12	0.38	0.03
41	Protein Vs Abdominal Strength & Endurance	0.04	0.44	0.75*	0.09	0.15
42	Iron Vs Abdominal Strength & Endurance	0.56	0.44	-0.34	0.03	-0.70
43	Energy Vs Arm & Shoulder Endurance	0.04	0.08	0.02	0.54	0.46
44	Carbohydrate Vs Arm & Shoulder Endurance	0.01	-0.19	-0.17	0.56	0.46
45	Fat Vs Arm & Shoulder Endurance	0.07	0.05	0.33	-0.34	-0.25
46	Protein Vs Arm & Shoulder Endurance	0.01	-0.45	0.09	0.51	0.72
47	Iron Vs Arm & Shoulder Endurance	0.28	-0.34	0.02	0.25	-0.43

● - Significant at both 5 % & 1 % level [$p<0.01$]
* - Significant at 5 % level but insignificant at 1 % level [$0.01<p<0.05$]. The rest of the values show insignificant differences [$p>0.05$]

With the exception of swimmers from age group 13+, majority of swimmers from 10 +, 11 +, 12 + and 14 + age groups were rated above minimum

standard of endurance for arm and shoulder (Table 13).

Majority of female swimmers showed poor abdominal strength and endurance (below 10 percentile) (Table14). It might be because of either lack of regular abdominal exercises or due to low motivation during endurance. Energy & three major energy yielding nutrients showed direct positive relationship with abdominal strength and endurance & with arm and shoulder endurance indicating need of good quality food in required quantity (Table 16).

Flexibility is the ability to move a muscle through a full range of motion. A lack of flexible joints and muscles hinders the performance of routine movement *(Thani, 2001).* From Table 15, it can be seen that majority of swimmers successfully passed the flexibility test.

To obtain maximum results, the sportsperson has to be fit. Amongst all aspects of various factors playing major role in this foundation of fitness, good nutrition gets a lion's share in 'building' an appropriate body for the best performance. The body needs the right kind of fuel to hit the record. Nutrition not only plays a role in performance, but it also helps to prevent injuries, enhance recovery from exercise, help maintain body weight, & improve overall health.

Summary & Conclusion

Present study revealed that majority of swimmers was meeting standards of body weight for the age & height. It is said that height is genetically influenced. This might be the reason of swimmers not meeting the standards of height for their age. LBM increased with age which might be attributed to regular practice & constant involvement in the sport. The results of this study tend to confirm the fact that regular engagement in sports lead to increase in LBM which clearly depicts a relationship between sports training & a tendency towards a healthier life. Swimmers were not meeting their daily energy demands which might be due yo comparatively less carbohydrate content of diet as swimmers were exceeding their requirements for fat & protein. An athlete's needs are large to delay fatigue, prevent cramp, maintain strength and enhance endurance. It is imperative for the nutritionist to provide guidance during their travel, maintain time and choose foods of the right type to help in recovery and also to guide in choosing foods before, during and after an event. Physical activity places a huge demand on energy requirements and systematic exercise, as in athletes need a well-planned diet. Diet plays a very significant role in giving the winning edge to the athletes.

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Effect of One-Year Exercise Programme on Psychological State of Elderly People

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Abstract

Number of elderly people is increasing very fast than any other segment of our population. They face many problems due to various reasons. Their sufferings are intensified by fixed and reduced income, dispersal of children and fellow friends, and loss of social support. The purpose of this study was to observe the effect of one-year exercise programme on psychological state of elderly people.

Twenty male subjects in each of the three groups (Group-A:60-69 years, Group-B:50-59 years and Group-C:40-49 years) were the subjects of this study. Each group sub-divided into one experimental group (N=10) and one control group (N=10). All experimental groups (AE, BE & CE) underwent into individual specific exercise programme (50-70 min/session, 5 sessions/week for one year). Exercise programme consisted of suppling exercise, jogging/walking, stretching, and cool-down exercise. Control groups (AC, BC & CC) did not take part in any physical activity programme. Psychological state was measured by Anxiety (Spielberger's State-Trait anxiety Inventory, 1970) and Depression (Depression Scale – Karim & Tiwary, 1986). Pre- and post-tests were conducted before and after one- year experimental period. Intra- and inter-group comparisons (pre- and post-test data) were made by paired and independent t-test and level of significance was set at 0.05 level of confidence.

It was observed after that after one-year experimental period state anxiety and depression level reduced significantly ($p<0.05$) in all experimental groups and trait anxiety significantly reduced in AE & CE groups. And in control groups trait anxiety and depression of three groups and state anxiety of AC & CC increased significantly after one-year duration. Therefore it may be concluded that regular moderate physical exercise can reduce and maintain psychological state of elderly people.

Key Words: Elderly People, Psychological State

Introduction

The number of elderly people is rising faster than any other segment of our population. In the elderly, changes - as a result of aging, have deleterious impacts upon bodily systems, those are likely to be: i) reduced capacity of respiratory system to take inadequate quantity of oxygen, ii) reduced efficiency of gastrointestinal system in extracting nutrition, iii) diminished output of the cardiovascular system, due to heart's decreased strength and/or hardening and shrinking of arteries iv) slowing and reduced efficiency of urinary system at excreting toxins and other body waste *(Mahajan, 1997)*. Decline in these functions, in turn, have severe repercussions on the psychosomatic and psychological performance *(Weg, 1983)*.

The psychological problems faced by the elderly are complex and numerous. Three sources are account for the increase in major psychological problems; because older people can – i) become exposed to 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) loss social support because of the death of spouse and friends, dispersal of children due to their job and/or wedlock, and disengagement from social life *(Harba et al., 1997)*. From middle age onwards a person confronts changes in the social environment and in his physical body, which require readjustment on his behavioural pattern. In the elderly, increase of the psychological problems like – low self-esteem, anxiety and depression are common. However, these problems can be tampered by the adequacy of the individual's social support. Friends, fellow workers, family members and neighbours can ease the burden. But if one is cut of from work, from children and from spouse, the changes of trauma increases manifold *(Chadha & Khuble, 1997)*.

Due to various reasons as many as 25% of the elderly population suffers from mild to moderate depression, anxiety and other emotional disorders *(Sheperd et al., 1987)*. Physical activity participation by older adults is associated with quality and quantity of life thus it reduces anxiety and depression; improves mood and feelings of well-being along with improvement at physical and mental levels *(Singer, 1992; Rikli, 2000)*. Benefits of exercise are mainly tri-fold; it - i) promotes health ii) avoids disease, and iii) implies satisfaction with living *(Paffenberger et al., 1996)*. Studies *(Blumemthal et al., 1989; Mossess et al., 1989; Emery & Gatz, 1990)* related to the effect of exercise, with its various form, intensity, and duration on to different group of people establishes that physical activity is a good intervention for psychological well-being of the elderly. But, there is a dearth of scientific study in the area like effects of long-term exercise on the psychological state of the elderly people in our country. With this background, the present study was undertaken.

Materials and Method

Subjects: Sixty male volunteers were assigned to three groups according to age. There were twenty male volunteers, in each of the three groups (Group-A: 60-69 years; Group-B: 50-59 years and Group-C: 40-49 years). Each group was again equally sub-divided at random into one experimental group (n=10) and one control group (n=10). Subjects were recruited from the vicinity of Kalyani University, Kalyani, West Bengal, India.

Psychological State: Psychological state of the subjects was measured through anxiety and depression; the most used two measures for predicting psychological state of a person (Singer,1992). State-Trait Anxiety Inventory (Spielberger et al., 1970), commonly known as STAI was used for measuring state and trait anxiety. STAI is perhaps the most extensively used and highly regarded instrument for the assessment of state and trait anxiety in any area of psychological investigation *(Levitt, 1980)*. STAI consists of separate self-report scales for measuring two distinct anxiety concepts: state anxiety and trait anxiety, each having twenty statements. The respondents are required to rate themselves on a four-point scale; 'not at all' to 'very much so' symptoms, which they experience. Depression was measured by depression scale *(Karim & Tiwari, 1986)*. The scale is a self-report measure used to assess behavioral manifestations of depression. It contains 96 items, having five options for each item; "not at all" to "extremely" on various depression related symptoms,

which an individual experience. The level of depression of a volunteer was the percentile score obtained from summation of scores of the 96 items.

Intervention: The three experimental groups underwent in an exercise program of one-year duration (5 days/week). In the beginning, the exercise program for three groups was 45 - 55 min/session. And each exercise session consisted of suppling exercises and stretching of big muscles - 10 minutes, rest -2 minutes, brisk walking/jogging @ 1 km/10 min. – @1 km/15 min. for 20-30 minutes, rest -5 minutes and loosening and callisthenics – 5 minutes. After every three months the walking/jogging time was increased by 5 minutes and finally the duration of a session was 65 - 75 minutes.

Design: The duration of the study was one-year. Volunteers were tested twice, i.e., pre-test & post-test, one-year duration in between. Experimental groups followed exercise program specific to their age group and the load was increased after 3-month interval. And the control groups were used to perform their normal daily work. Random group design was used in this way.

Data Analysis: Data were analyzed using SPSS version 10.0. Mean and standard deviation were used as descriptive statistics for all groups. Independent t-test was used to predict inter-group difference and pair t-test was used to intra-group difference of scores in pre-and post-test. Level of significant difference was set at $P<0.05$ level.

Results

Table-1 shows the results of descriptive statistics by mean value and standard deviation of the state anxiety levels of the three age groups (both experimental and control groups). The data reveal that the higher the age the higher is the level of state anxiety in the subjects of this study. Significant reduction ($p<0.05$) in state anxiety is observed in the three experimental groups during post-test. On the contrary, there is a significant increase of state anxiety levels of the two control groups (Group-A & Group-C) during post-test. Data of this study also reveal that there is no difference in state anxiety level between experimental and control groups of the three age category during pre-test. But, significant change is observed in the state anxiety level of experimental and control subjects after the end of one-year experimental period.

Table – 1: Comparison of Pre- and Post-test Data of State Anxiety

Group	Pre Test		Post Test		t-value (Intra-group)	t-value (Inter-group)	
	Mean	±SD	Mean	±SD	Pre vs Post	Pre	Post
AE	44.73	7.68	38.45	6.39	4.281*	0.528	3.426*
AC	47.20	12.10	52.20	10.4	3.497*		
BE	36.33	3.92	32.22	2.82	3.426*	0.528	3.426*
BC	35.00	5.71	36.70	4.15	1.537		
CE	34.00	3.35	29.40	2.37	6.147*	0.828	2.930*
CC	32.40	4.74	34.70	4.88	3.997*		

*** Significant at 0.05 level**

Table – 2: Comparison of Pre- and Post-test Data of Trait Anxiety

Group	Pre Test		Post Test		t-value (Intra-group)	t-value (Inter-group)	
	Mean	SD	Mean	SD	Pre vs Post	Pre	Post
AE	42.55	7.61	48.18	7.72	6.690*	0.279	2.381*
AC	49.30	9.56	51.6	8.83	3.735*		
BE	39.22	5.29	36.11	3.21	1.921	0.777	4.200*
BC	40.90	3.42	43.00	3.55	5.547*		
CE	38.50	4.84	34.00	3.82	7.997*	0.034	2.422
CC	38.60	7.47	40.60	7.23	3.354*		

*** Significant at 0.05 level**

The data of Table-2, as shown by mean values, reveal that there is a tendency of high level of trait anxiety according to increased age category of the subjects. Reduction in trait anxiety level, after one-year experimental period, is observed in the three experimental

groups, and it is significantly reduced (P<0.05) in experimental Group-A and Group-C. However, in all the three control groups, significant increase of trait anxiety observed during post-test. It is also observed that there is no significant difference between experimental and control groups' trait anxiety during pre-test, but significant difference persists in trait anxiety level in three groups during post-test. Because, during this period experimental subjects' trait anxiety level reduced significantly and in the three control groups it increased significantly after one-year period.

Table – 3: Comparison of Pre- and Post-test Data of Depression

Group	Pre Test		Post Test		t-value (Intra-group)	t-value (Inter-group)	
	Mean	SD	Mean	SD	Pre vs Post	Pre	Post
AE	45.6	8.74	36.31	11.96	5.101*	1.269	3.115*
AC	52.67	14.49	56.13	15.36	3.342*		
BE	33.74	7.67	25.27	8.45	8.682*	1.444	0.56
BC	27.64	7.44	31.01	7.37	3.714*		
CE	33.23	11.78	25.86	12.16	9.942*	1.661	1.483
CC	25.23	11.71	28.95	11.13	2.725*		

*** Significant at 0.05 level**

Table 3 shows (mean values) that the level of depression is higher in accordance with the higher age of the subjects of this study. Comparing pre-and post-test data it is observed that there is a significant reduction in depression in all the three experimental groups. On the contrary, significant increase is observed in depression level of the three control groups at post-test. Data also reveal that there is no difference in depression level of experimental and control subjects, during pre-test in any age category. However, there is a significant difference in depression level of experimental and control group of Group-A (in senior citizens) during post-test. But, in younger two groups there is no difference between experimental and control groups even during post-test.

Discussion

In the present study, considerably lower level of anxiety is observed in the persons who took part in the exercise program of one-year duration. On the other hand, those who remained sedentary during that one-year duration, they have increased their anxiety levels. Similar results are observed in the studies of leading researchers *(Shephard, 1978; Morgan & Goldston, 1987)* who conducted research to observe the effects of exercise on anxiety levels of different population and reveal the notion that exercise, either acute or chronic, can reduce anxiety level. There are extensive studies *(Shephard et al., 1987; Blumenthal et al., 10; Mossess et al., 1989)* on exercise and anxiety. Similarly, studies *(Singer, 1992; Koening & Blazer, 1996)* also recommend that physical activity is beneficial for reduction of depression among elderly.

When anxiety is considered as one of the measures of psychological well-being of the senior citizens, it is observed that after a 12-week exercise training program anxiety level reduced significantly and improved quality of life. On the contrary, among non-participants, anxiety levels remain unchanged. This phenomenon also reveals that there is a positive effect of aerobic exercise on mood state and anxiety level of normal individuals *(Steptoe & Bulton, 1988)*. It is also observed that exercise can help to reduce the anxiety levels of special group of older adults *(Schwab et al., 1985)* and of young adults *(Ekkekakis et al., 1999)*.

In this study change in the depression levels of the experimental and

control groups are observed at the end of one-year experimental period, when experimental groups reduce significantly and control groups increase significantly in their depression level. However, both in the pre-or post-test, there is no difference in depression level between experimental and control subjects of Group-B and Group-C. It is to mention that though there is no difference in depression level of experimental and control groups of 60^{+} age category during pre-test, but it is significantly differs after one-year experimental period. Depression level of Group-A group i.e., senior citizen group, is high than other two groups. It is observed that depression becomes peak in the teens and it drops off with age until the 60s and then increases remarkably with old age *(Miroswky & Ross, 1992).* This trend is also obtained from the findings of the present study, where a huge difference is observed in depression of below 60-year and above 60-year age groups, either in control and experimental groups. Higher depression in the elderly is mainly due to three reasons – i) economic stress, ii) loss of social support, and iii) poor health *(Harba et al., 1997).*

Depression in the elderly has a wider rang of genetic, psychosocial and acquired biological determinants *(Koening & Blazer, 1996).* Studies on depressed persons have revealed that aerobic exercises are as effective as different forms of psycho-therapy, and that exercises have anti-depressive effect on patients with mild to moderate forms of depression. It is also found that physical activity is more beneficial than recreational activities for all variety of depressive disorders *(Singer, 1992).* Studies on the effectiveness of aerobic exercise on depressed persons are quite limited *(Singer, 1992).* However, there are a few studies *(Blumenthal et al., 1989; Emery & Gatz, 1990)* those are very similar to the present study shows some improvement in psychological state of the elderly adults by reducing their depression level through aerobic exercises.

It is observed that as many as 25% of the population suffers from mild to moderate depression, anxiety, or any other psychological disorders. Some could cope with these disorders individually without professional assistance. However, physical activity can be a promising aid for such people *(Bouchard et al., 1990).* Extensive review on psychological benefits of physical activity reveals that exercise can – i) help reduce state and trait anxiety, ii) help decrease the level of mild to moderate depression, iii) be an adjunct to professional treatment of psychological disorders *(Singer, 1992).* There is also strong evidence in support of the present study that physical activity of chronic in nature is capable of reducing depression in moderately depressed individuals. And both of short-term and long-term exercise can improve elderly adults' psychological state and mental well-being *(Morgan & Goldston, 1987).*

Conclusion

Though present study has some limitations i.e., we did not consider the socio-economic status of the subjects, yet, on the basis of the findings of related study, the following specific conclusions are drawn.

1. Anxiety and depression levels of experimental groups reduced significantly (except trait anxiety of Group-BE) and those psychological

states were increased in control groups (except state anxiety of Group-BC) after the one-year experimental period.

2. In the beginning of the study there was no difference between experimental and control subjects, however the differences in psychological states were remarkable after one-year.
3. Higher the age group, higher was the level of anxiety and depression in both control and experimental groups.

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Effect of Shaktipat Meditation on Anxiety in Relation to the Emotional Intelligence and Age

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Abstract

The present investigation is based on research study undertaken to find out the effect of *Shaktipat* meditation on Anxiety of student- teachers. An experiment was conducted on 152 student-teachers of B. Ed. on the basis of non-randomized control group pre-test post-test design. For data collection, Comprehensive Anxiety Test developed by Sharma et al (1992); Raven's Standard Progressive matrices (revised 2000); and Seven-Fold Emotional Intelligence Scale (SFEIS) developed by Khaira et al (2004) were used. Analysis by ANCOVA revealed that *Shaktipat* Meditation was an effective practice to reduce Anxiety of student- teachers. High, average and low Emotional Intelligence (EI); different age categories (20 to 23; 24 to 27; 28 to32 years) student-teachers had equally benefited from meditation when pre-Anxiety and pre-Non-verbal Intelligence (NVI) were statistically controlled.

Key words: Shaktipat Meditation, Anxiety, Emotional Intelligence, Non-verbal Intelligence

Introduction

Anxiety is a psychological and physiological state characterized by cognitive, somatic, emotional, and behavioral components *(Seligman et al. 2001).* In psychiatry it is a relatively permanent state of worry and nervousness occurring in a variety of mental disorders, usually accompanied by compulsive. Anxiety energies the person to move, but if the anxiety is not at its proper level it leads the person to emotional disturbance. In such persons it becomes so unmanageable that it may lead to disintegrative adjustment like crime, alcoholism, drug addictions, sex perversion or sometimes suicide. Such unmanageable level of anxiety affects the conscious as well as unconscious mind of person.

Few studies supported that Anxiety is related with EI as Brackett et al. (2003) found that lower emotional intelligence related to negative outcomes, including stress, illegal drugs, alcohol use, deviant behaviour and poor relations with friends. Santesso et al. (2006) found that low emotional intelligence was associated with significantly more externalizing behaviours (i.e. aggression and delinquency), replicating previous work. Gill (2004) stated that the emotional maturity of an individual i.e. self-control, patience, perseverance-sensitivity, interpersonal effectiveness etc. would determine to a great extent an individuals ability to cope with stress.

Ealy (1993) showed that teachers with more teaching experience had lower levels of anxiety; there was no evidence that self-efficacy increased as years of teaching increased and younger teachers

were more inclined to have higher levels of anxiety. *Brook (1995)* exposed that age, emotional intelligence, and ethnicity had little influence on congruence for anxiety or depression. *Pich (2000)* found only statistically significant correlations between state anxiety and age, and self-efficacy and age based on one of the measures for each. *Emmons (2003)* concluded that emotional intelligence, age, computer experience, and all influence computer anxiety. *Disayavanish (1995)* showed the meditation treatment reduced the level of all of the following psychopathological variables: obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. *Anderson (1996)* indicated that meditation was an effective intervention to reduce perception of stress and anxiety and aspects of experienced burnout in a heterogeneous group of teachers. *Debra (1998)* revealed that practitioners of the transcendental meditation program had decreased scores on tests of anxiety and mood disturbance. Increased regularity of practice of the transcendental meditation program was associated with a decreased POMS Tension-Anxiety score. *Sagula (1999)* reported that drop-outs were characterized as having higher state anxiety and being in the initial phases of grieving. *Carlisle (2005)* found the efficacy of transcendental meditation in stress reduction, increased positive experiences/behaviours and fewer negative ones, the development of the health, relationships, self-concept, and psychological well being of employees. *Arana (2006)* supported predictions that increase in mindfulness lead to reductions in shyness, social anxiety, and anxiety in general. It explores the alleviation of psychological suffering through the use of the spiritual practice of meditation and the altered states of consciousness associated with this practice. On the basis of above observations the present study with *Shaktipat* meditation was designed.

Shaktipat: A Technique of Meditation

Shaktipat is a technique of meditation. Literally meaning of *Shaktipat* is "establishing power or energy in its actual place". It is fluctuating energy level, which is responsible for varying physical and mental states. The body's energy centres are called *Chakras*. There are seven major *chakras* reside along the spine and the head i.e. *Mooladhara*, *Swadishtan*, *Manipura*, *Anahata*, *Vishuddh*, *Ajna*, *Shahasrara*. Energy flows from the bottom to the top through the inter-mediate chakras. These chakras are affected by different psychological characteristics. Due to gravitational pull of the earth, flow of energy in most of human beings is down ward. Expert helps (by deep breathing techniques) to change the flow of energy, from downward to upward, which brings positive affective psychological changes.

Objectives

1. To study the effect of *Shaktipat* Meditation on anxiety of student-teachers.
2. To study the effect of meditation, EI and their interaction on anxiety by taking pre-anxiety and pre-intelligence as covariates.
3. To study the effect of meditation, age and their interaction on anxiety by taking pre-anxiety and pre-intelligence as covariates.

Material and Method

Participants

For present study B.Ed. students from Lovely Institute of Education, Phagwara, Govt. College of Education, Jalandhar and G.N. College of Education Kapurthala, were selected on voluntarily basis. In Govt. College and G.N. College of Education, only hostellers were approachable for meditation. Age range of students was between 20 to 32 years. Total 152 subjects participated in the present study out of which 92 were in Experimental and 60 in Control group.

Instruments

Comprehensive Anxiety Test prepared by Sharma et al (1992) Raven's Standard Progressive matrices (revised 2000), and Seven-Fold Emotional Intelligence Scale (SFEIS) developed by Khera et al (2004) were used to collect data.

Experimental Design

The present study was experimental in nature. It was based on the lines of non-randomized control group pre-test post-test design.

Procedure

Students, who voluntarily offered themselves to practice Meditation, were divided (randomly) into two groups i.e. experimental and control groups, from each College. Before the start of the experiment, anxiety test was administered to collect pre-anxiety and intelligence scores. The experimental group students were practiced *Shaktipat* Meditation for three months (105 sittings i.e. first five days 4 sittings and rest days one sittings daily) at the rate of one hour per sitting under the supervision, direction & guidance of the expert (Mata Yog Amrit Ji from Amritdham Meditation Center, Hoshiarpur). In Both Colleges Meditation was practiced through *ShaktiPat Vidhi* only. At the end of the treatment the Anxiety Test was administered separately to the student of both experimental and control groups. Scoring of all the tools were done as directed in their respective manuals.

Results

Table 1: Group and Test wise Mean and Standard Deviation of Scores on Anxiety

Group	Pre-Test		Post-Test	
	Mean	SD	Mean	SD
Control	39.58	16.03	38.37	16.62
Experimental	36.86	14.47	28.92	13.38

Table 2: Summary of 2x3x3 Factorial Design of ANCOVA for Anxiety by taking Pre-Anxiety and pre-NVI as Covariates

Source of Variance	SSyx	*df*	MSSyx	*F*yx	Sig.
Treatment	2378.56	1	2378.56	14.66	0.001
EI	330.99	2	165.50	1.02	0.36
Age	427.69	2	213.84	1.32	0.27
Treatment x EI	48.82	2	24.41	0.15	0.86
Treatment x Age	10.82	2	5.41	0.03	0.97
EI x Age	370.81	4	92.70	0.57	0.68
Treatment x EI x Age	185.19	4	46.30	0.29	0.89
Error	21418.21	132	162.26		
Total	197875.00	152			

Table 2 reveals that the adjusted F value for Meditation is 14.659, which is significant at 0.001 level with *df* 1/132. It indicates that adjusted mean score of Anxiety of experimental group and control group differ significantly when pre-Anxiety and pre-NVI were considered as covariates. In the light of this null hypothesis that there is no significant effect of *Shaktipat* Meditation on Anxiety, is rejected. Further, the adjusted mean score of anxiety of the experimental group

(28.977) is lower than that of the control group (35.935). It reflects that meditation practiced to experimental group was found to be significantly effective to reduce the Anxiety level of student teacher when both groups matched with respect to pre-Anxiety and pre-NVI. Effect-size estimates was 1.00 for Anxiety level. Cohen (1969) indicated that an effect size of .80 should be considered large for most statistical tests in psychological research.

The adjusted F value for EI is 1.020, for age is 1.318, for interaction between meditation and EI is 0.150, for interaction between meditation and age is 0.033, for interaction between EI and Age is 0.571, for interaction between meditation, EI and Age is 0.285 which are not significant.

Discussion

Shaktipat Meditation helps an individual to make mind silent. This silence of mind is helpful to reduce 'disturbed state of mind' and enhanced relaxation *(Kjellander, 1994; Stewart, 1995; and Telles et al., 1993).* In the present study it was found that Shaktipat Meditation was an effective technique to reduce anxiety of student-teachers when pre-anxiety and pre-NVI were taken as covariates Anxiety reduction as effect of meditation was reported by most of the previous studies as *Singh et al. (2007), Tamborrino (2001), Gaur (1994), Disayavanish (1995), Anderson (1996), Debra (1998), Sagula (1999), Stevens (2000), Carlisle (2005), Arana (2006)* and many others.

There was no significant effect of EI on Anxiety when pre-Anxiety and pre-NVI were taken as covariates. It means that student-teachers with High, average and low EI had Equal level of Anxiety. Anxiety was found to be independent of age when pre-anxiety and pre-non-verbal intelligence were considered as covariates. It is recognizable that results with all statistically controlled variables are matching; hence, it may vigilantly conclude that age did not influence anxiety of student-teachers. It denotes that different age-groups (20 to 23; 24 to 27; and 28 to 32 years) of student-teachers had Equal level of anxiety. Compatible to this finding, *Craven (2000), Tamborrino (2001) and Velazquez-Zamora, (2001)* divulged that anxiety was not significantly correlated with age. Differing to these *Brook (1995), Emmons (2003) and Pich (2000)* discovered positive correlation between age and various types of anxiety that is higher the subject's age, the higher the subject's anxiety. Reverse to these *Ealy (1993)* divulged that age was negatively related to anxiety. Reason of inconsistency between present and previous findings may be difference in sample size. Secondly, age range of sample of present and previous studies is varying. The most of the previous studies (except studies regarding effect of meditation) were survey or descriptive studies which involve large sample. As the present study was experimental in nature, that is why, sample was relatively small. The findings in the present study should peruse in this light.

There was no significant effect of interaction between meditation and EI; between meditation and age; between EI and age; and between meditation, EI and Age on Anxiety when pre-Anxiety and pre-NVI were taken as covariates. It

means that both high, average and low EI; different age categories (20 to 23; 24 to 27; 28 to 32 years); and student- teachers of age categories 20 to 23 years with high, average and low EI, student-teachers of age categories 24 to 27 years with high, average and low EI, and student- teachers of age categories 28 to 32 years with high, average and low EI gained Equal benefits of Shaktipat Meditation when pre-Anxiety and pre-NVI were statistically controlled. Consistency of the result suggested that Meditation should a part of education.

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Spiritual Intelligence, Altruism, School Environment and Academic Achievement as predictor of Mental Health of Adolescents

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Abstract

The present study was design to examine the joint contribution of Spiritual Intelligence, Altruism, School Environment and Academic Achievement for predicting Mental Health of senior secondary school students. Total 934 students of class +1 (mean age 16.4 Years) studying in schools affiliated to Punjab School Education Board were taken as sample. Mental Health Battery (2000) developed by Singh and Sen Gupta; Spiritual Intelligence scale (2006) developed by Singh, Altruism scale (1988) developed by Rai and Singh; School Environment inventory (2002) prepared by Misra were used to collect data. Result through multiple correlation and regression analysis revealed that Type of school, Spiritual Intelligence, Altruism, rejection (dimension of School Environment) and control(dimension of School Environment) were the significant predictor of Mental Health; and gender, location of residence, creative stimulation, cognitive encouragement, acceptance, permissiveness and Academic Achievement were not significant predictors of Mental Health.

Key Words: Mental Health, Spiritual Intelligence, Altruism, School Environment and Academic Achievement

Introduction

The thing, which is mostly desired in all the societies of the world, is the need of preserving Mental Health of the individual. Mental Health as the health of one's mind, which can prove a potent determinant of one's integrated personality and balanced behaviour identified on the basis of the level of his adjustment to his self, others and environment. The acquisition of such personality is indeed a great asset and privilege for a normal individual.

According to World Health Organization (WHO) 'The state of health is defined as a state of complete physical, mental and social well-being and not merely 'an absence of disease' or infirmity'. WHO also suggested a fourth dimension i.e. 'spiritual well-being' *(Kapur, 1995).* In this way spiritual trait is a part of Mental Health. Many researches revealed this relationship such as *Inang (2002)* revealed that optimism, quality of life, satisfaction with life and spiritual health were found to be positively and significantly related with subjective well being. *Jones (1998)* indicated that there were strong associations between

Spirituality and religion, between spirituality and Mental Health, as well as between spirituality and physical health. It was indicated that the linear combination of spirituality, physical health, and age were the best predictors of Mental Health. *Burke (1999)* supported the very significant correlation between Mental Health and closeness to God, the distinctions between religiosity and spirituality as they relate to Mental Health, and the importance of spirituality while coping with pain in chronic illness.

School Environment may be defined as a measure of the quality and quantity of cognitive, emotional and social support that has been available to the students during their school life in terms of teacher- pupil interactions. *Sturm (2000)* reported that through positive relationships with their students teachers will then be able to provide emotional support, which may help the students adjust better to the increasingly demanding School Environment. *Mortimer (1993)* showed that 12th grade students who worked fewer than 20 hours per week had significantly higher grade point averages than students who did not work at all. *Orellana (2004)* showed statistical significance and positive correlation between the School-Based Mental Health Program and the Academic Achievement based on the four indicators (absences, suspensions, disciplinary actions, and grade point average). *Young et al. (2007)* suggestions for organizations to enhance wellness in Mental Health practice and schools by changing policies, increasing professional identification, supporting counselor wellness, and improving safety.

Prosocial behaviour is defined by *Bar Tal (1976)* as voluntary behaviour that is carried out to benefit without anticipation of external rewards. *Driver (1987)* examined the hypothesis that people who tend to have positive moods, high self-esteem and a positive sense of well-being would feel more benevolent towards others than individuals characterized by more negative moods, low self-esteem and a poor sense of well-being. *Schwartz (2003)* has set up a starting point for future research on the subject of Altruism and its possible health benefits. *Todd (1998)* revealed that problematic social ties and downward social comparison together predicted over 48% of the variance in resilience. In response to open-ended questioning, more than 70% of the participants named social support, religious/spiritual beliefs, and their children as important contributors to their resilience.

After reviewing the above painted literature the investigator design a study to examine the joint contribution of Spiritual Intelligence, Altruism, School Environment (dimension wise) and Academic Achievement in predicting Mental Health of senior secondary school students.

Materials and Method

Data was collected from 934 students of class +1 studying in schools affiliated to Punjab School Education Board. The structure of sample is given in table 1.

Table 1: Structure of Sample

Variable	Category	N
Gender	Boys	344
	Girls	590
Location	Urban	371
	Rural	563
School	Govt.	588
	Aided	227
	Unaided	119
Total		934

Mental Health Battery (2000) developed by Singh and Sen Gupta; Spiritual Intelligence scale (2006) developed by Singh; Altruism scale (1988) prepared by Rai and Singh; School Environment inventory (2002) developed by Misra w**ere** used to collect data. The data were described and analyzed in the light of formulated objectives and hypotheses.

Results

Table 2: Coefficient of multiple correlation among the variables

R	R Square	Adjusted R Square
0.368	0.135	0.124

Table 2 shows the coefficient of multiple correlation among Mental Health, Spiritual Intelligence, Altruism, School Environment and Academic Achievement. The coefficient is 0.368 and its square is 0.135. this means that 13.5 % variance in mental heath is explained jointly by gender, location of residence, type of school, Spiritual Intelligence, Altruism, dimensions of School Environment and Academic Achievement of senior secondary school students.

Table 3: Summary of ANOVA for regression model

Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	**9211.274**	**12**	**767.606**	**11.994**	**0.001**
Residual	**58942.565**	**921**	**63.998**		
Total	**68153.839**	**933**			

Table 3 shows that F value is 11.994 which is significant at 0.01 level of significance with df 12/933. This means that the model presented is significant in predicting Mental Health of students. Thus the null hypothesis that there is no linear relationship of Mental Health to the independent variables, is rejected. Hence, this result suggested to calculate regression analysis, which is given in table 4.

Table 4: Summary of Regression Coefficient table for Mental Health

Model	**Un-standardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
Constant	**62.61**	**3.70**		**16.93**	**0.001**
Gender	**-0.89**	**0.59**	**-0.05**	**-1.51**	**0.130**
Location	**-1.06**	**0.58**	**-0.06**	**-1.82**	**0.070**
School	**1.68**	**0.42**	**0.14**	**4.03**	**0.001**
Spiritual Intelligence	**0.06**	**0.02**	**0.12**	**3.55**	**0.001**
Altruism	**0.28**	**0.04**	**0.21**	**6.53**	**0.001**
Creative Stimulation	**-0.05**	**0.05**	**-0.07**	**-1.12**	**0.264**
Cognitive Encouragement	**0.05**	**0.07**	**0.04**	**0.70**	**0.484**
Acceptance	**-0.06**	**0.07**	**-0.05**	**-0.94**	**0.350**
Permissiveness	**0.05**	**0.06**	**0.03**	**0.80**	**0.422**
Rejection	**-0.21**	**0.05**	**-0.15**	**-4.47**	**0.001**
Control	**0.17**	**0.06**	**0.12**	**2.60**	**0.009**
Academic Achievement	**0.03**	**0.03**	**0.04**	**1.17**	**0.244**

It is evident form the table 4 that variables type of school, Spiritual Intelligence, Altruism, rejection and control are the significant predictor of Mental Health. The other variables viz. gender, location of residence, creative stimulation, cognitive encouragement, acceptance, permissiveness and Academic Achievement are not significant predictors of Mental Health. The regression equation formulated from all these variables is as given below:

Mental Health = 62.61 - 0.89 X Gender – 1.06 X Location + 1.68 X School + 0.06 X Spiritual Intelligence + 0.28 X Altruism -

0.05 X Creative stimulation + 0.05 X Cognitive Encouragement - 0.06 X Acceptance + 0.05 X Permissiveness - 0.21 X Rejection + 0.17 X Control + 0.03 X Academic Achievement

Discussion

Type of school, Spiritual Intelligence, Altruism, rejection (dimension of School Environment) and control (dimension of School Environment) were the significant predictor of Mental Health and gender, location of residence, creative stimulation, cognitive encouragement, acceptance, permissiveness and Academic Achievement were not significant predictors of Mental Health. *Gupta (2002)* concluded that there was a significant difference between Mental Health of Government and Private school adolescents. For Spiritual Intelligence *Inang (2002), Jones (1998), Andersen (2000), Burke (1999), Wilcoxon et al. (2008), Sobel (1997), Alexander (2001)* supported; and for Altruism *Khanna (1992), Sharman et al. (1992), Batson (1989)* supported the present finding. The result for rejection (dimension of School Environment) and control (dimension of School Environment) are (indirectly) supported by *Bullerdick (2000), Reddy et al. (2002*). Further regression equation for calculating or finding out Mental Health of senior secondary school students was established as Mental Health = 62.61 - 0.89 X Gender – 1.06 X Location + 1.68 X School + 0.06 X Spiritual Intelligence + 0.28 X Altruism - 0.05 X Creative stimulation + 0.05 X Cognitive Encouragement - 0.06 X Acceptance + 0.05 X Permissiveness - 0.21 X Rejection + 0.17 X Control + 0.03 X Academic Achievement. It means that on the basis of scores on above said variables the scores of Mental Health can be obtained or predicted.

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A Study of Personality Dimensions in Sports Performance

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Abstract

The present study examined the cognitive, affective and conative aspects of personality contributing in high level sports performance. Tests of FDI cognitive style, sensation seeking, attribution style (locus of control scale) were administered on the interuniversity players (high level performance group) and on intercollegiate players (low level performance group). The results of the discriminant analysis indicates that the two groups of players were significantly different in their cognitive style, attribution style, and sensation seeking personality dimensions discriminant function (Wilks lambda=0.82, p<.001). Significant F ratio indicates that the three personality dimensions differentiate individually, the two groups in sports performance. The personality dimension attribution style (external locus of control) in sports performance contributed for high level performance, 50.72% of the total discriminantes, contribution of FI cognitive style for the high level performance in sports was 32.80%. Sensation seeking contribution was found to be lowest of the total variance.

Key Words: Cognitive Style, Attribution Style, Sensation seeking, Sports Performance

Introduction

Predicting the likely hood of success in a promising junior athlete in to an accomplished senior performer has been dream of every recruiter in sports or any other job. Personality attributes feature quite prominent in important life outcomes; as in academic achievement *(Ferguson & James, 2000)* vocational choice,as well as in sports and exercise related behavior, *(Aidman & Chofield, 2004, Auweele et al, 2000).* A wide variety of personality variables have been found to be associated in levels of achievement *(Davis & Mogak, 1994; Kirkcadly, 1982)* in a number of sports , including basketball *(Evans & Quarterman, 1983),* hockey *(William & Parkman, 1980),* football *(Wilson & Freeman, 1986).* Growing evidence suggest that emotional stability is associated with athletic success *(Garfield & Bennett, 1984; Terry, 1995).* Researches also reveal that successful outcome by and large attributed to stable, controllable and internal causes *(Robinson & Howe1, 987).* Extroverts have been found to excel in sports *Eysenck (1995).* In sports information processing style of the sports person is important. How the players perceive the game and respond to it. A person high on field independence is said to seek differentiated information with well distinguished parts, where as field dependent person lacks internal organization ability. The field independent players have been found to be more physically active *(Liu.w., 2006; Guillet & Collet, 2004; Lu & Suen, 1995; Skaggs et al, 1990).*

Optimal level of stimulation, arousal or excitation is necessary. It has been proposed by scholars that risk taking and sensation seeking have been reported to be related with sports behavior. It is

also reported that numerous outdoor activities are related with sensation seeking (*Zukerman, 1983).*

Sports and games have their specific physical and activity requirement, attribution to success or failure makes an important impact on the performance of the players *(Maureen & Lisen, 1993; Robinson & Hove, 1987; Kerr & Beh, 1995, Hamilton & Jordon, 2000).* Locus of control is related to an athlete's perception and description about the outcome of the situation. There are two types of locus of control, one is internal locus of control and second is external locus of control. Athlete with internal locus of control describes the outcome within his control.

The literature on sports psychology reveals that the cognitive domain, affective domain, co native domain of the players makes difference in his performance. In sports arena there has been little evidence about the relationship, and contribution of personality dimensions specifically FDI cognitive style, sensation seeking and attribution style. It is important to know which of the personality dimensions contribute most in the high level performance. The knowledge of sportsman's personality when made available may be useful in achieving excellence in sports.

The study aims at examining the contribution of the personality dimensions FDI cognitive style, sensation seeking, and attribution style in high level sports performance.

Method: - The subjects of the study were 500 interuniversity players and 500 intercollegiate players with a mean age of 22.5 years. The psychological tests used to were,. the hidden figures test assess the FD I cognitive style ,Hindi version of Zukerman's scale of sensation seeking to assess sensation seeking and Hindi adaptation of Rotters scale of locus of control to assess the attribution style of the subjects. The subjects were personally met and were asked to give the responses on the questionnaires after proper instruction for filling the questionnaire.

The dependent variable in the study was taken as the sports performance and the independent variables were the personality dimensions, cognitive style, sensation seeking and attribution style.

Results and Discussion

The dependent variable being non metric the most suitable analysis discriminate analysis was computed to find out the set of personality components which discriminate high level and low level sports performance the results of the analysis is presented in the tables 1, 2.

Table 1:-Summary of the set of personality components discriminating high and low level of sports performance

PERSONALITY DIMENSION	WILKS LAMBDA	F-RATIO	SIGNIFICANCE
Fd-I cognitive style	0.956	46.42	0.00
Sensation seeking	0.937	67.60	0.00
Attributive style	0.871	147.51	0.00

Table 2- showing canonical discriminant function

FUNCTION	CANONICAL CORRELATION	WILKS LAMBDA	CHI SQUARE	P
1	0.418 (16% variation)	0.82	191.43	0.001

Table 2 shows the coefficient of multiple correlation among Mental Health, Spiritual Intelligence, Altruism, School Environment and Academic Achievement. The coefficient is 0.368 and its square is 0.135. this means that 13.5 % variance in mental heath is explained jointly by gender, location of residence,

type of school, Spiritual Intelligence, Altruism, dimensions of School Environment and Academic Achievement of senior secondary school students.

Table 3: Summary of ANOVA for regression model

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	**9211.274**	**12**	**767.606**	**11.994**	**0.001**
Residual	**58942.565**	**921**	**63.998**		
Total	**68153.839**	**933**			

Table 3 shows that F value is 11.994 which is significant at 0.01 level of significance with df 12/933. This means that the model presented is significant in predicting Mental Health of students. Thus the null hypothesis that there is no linear relationship of Mental Health to the independent variables is rejected. Two groups correctly classified 68.9%.

Table 4- Relative importance values of the personality factors discriminating high and low performance in sports. Variable description standardized discriminate function difference relative importance.

COGNITIVE STYLE	**.088**	**2.036**	**32.80**
Sensation seeking	**.068**	**1.321**	**16.18**
Attributive style	**.0171**	**1.636**	**50.72**

Wilks lambda is found to be significant (0.82, p<.001), which indicates that two groups of players were significantly different in terms of their discriminate function. The canonical correlation associated with this function is .418 indicates 16% of variation among the two groups, constituting dependent variable, sports performance. The significant f ratio indicates that the predictors differentiate the two groups significantly in sports performance.

It is revealed from the table 3 that the relative importance of the personality dimensions discriminating between the players of high and low sports performance groups. It further indicate that among the three variables the attributive style was found to be the most significant discriminating variable in sports performance groups accounting 50.72% of the total variance. The second important discriminating variable is FD-I cognitive style which account for 32.80 of the total variance. The third discriminating variable for sports performance groups is sensation seeking which contribute only 16.18 % of the total variance. on the basis of mean of the relative values the present study indicates that higher level sports performance showed external locus of control ,field-independent cognitive style, high sensation seeking in comparison to low sports performance group. It is clear from the findings of the study that for higher performance, external locus of control plays an important role in finding the avenues for better training, environment incentives etc. In various studies researchers have reported that players mostly attribute the internal factors for their success, whereas in the present study the high performing group has shown external locus of control.

The field independent cognitive style is also an important contributor in high level sports performance. The field-independent person has the ability to differentiate the information easily and comparison to the field-dependents *(Liu, 2006).*

It was thought earlier for sports activity stimulation or arousal is necessary. The sensation seeking personality factor may have role in determining the higher level performance in sports the results of the study reveals that amongst the three personality factors

sensation seeking least contributes in the high sports performance. The external locus of control and field independence cognitive style seems to be potential contributors for higher level performance in sports.

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Relationship between Competitive Performance and Selected Physiological Parameters of Elite Male and Female Gymnasts

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Abstract

The purpose of this study was to investigate and compare the physiological variables in relation to performance of elite male and female gymnasts of inter-university level. The subjects of the study were sixty three elite male and female gymnasts (males = 32, females= 31) of inter-university level belong to different cultural background of India and who represented their respective university teams in All India Inter-university Gymnastics Championships at Amritsar. Blood pressure (systolic and diastolic) and the heart rate, winning performance scores of elite male and female gymnasts were chosen as the criterion measures for the study. The results of the study indicated that both blood pressure and heart rate of elite male and female gymnasts were raised after the performance on competitive apparatus. There was no correlation between competitive performance of both gender and selected physiological parameters. Significant differences existed between pre-test and post-test heart rate, both blood pressure of elite female gymnasts of inter-university level, but similarity was found in the pre-test and post-test of systolic blood pressure in elite male gymnasts. Elite male and female gymnasts of inter-university level had similarity in their post-test heart rate, systolic and diastolic blood pressure, but similarity was found in the pre-test of heart rate in elite female gymnasts.

Keywords: Elite, Performance, Gender, parameters, Tests.

Introduction

In competitive situations, the sports are anxious to a certain degree which eventually affect their performance no human being is free from tension and stress. In the stressful setting provided by competitive sports it is usual to observe a player.

In many exercise and fitness magazines, the idea is established that heart rate alone is a good predictor of the aerobic benefits of exercise. This idea greatly oversimplifies the complexity and grand design of the cardiovascular system. Chamber size increase is a result of an increased filling rate during prolonged endurance training exercise. An increase in ventricular wall thickness occurs from high intensity strength training. The total peripheral resistance to blood flow increases due to muscle contraction. More pressure must be generated by the heart to move blood. *(Menzel, 1997).*

Exercise elevated both blood pressure and pulse rate, increasing more after jumping rope than after walking. Immediately after jumping rope, the pulse rate was about twice as high as the immediate pulse rate after walking. Blood pressure after jumping rope increased about 46% and 61% for systolic and diastolic, respectively, over walking. Additionally, it took longer for pulse rate

and blood pressure to return to their resting measurements after jumping rope than after walking. The pulse and blood pressure after walking had returned to normal after a thirty-minute rest, but after jumping rope neither had returned to normal after a thirty-minute rest. *(Roth & Roth, 2005).*

Many individuals are seeking alternative forms of exercise to running and swimming as a means of developing or maintaining a degree of physical fitness. Sports and games are frequently selected in the expectation that they will provide sufficient intensity and duration to elicit training effects, especially on the cardiovascular system. Several authors have stated that optimal training effects are obtained when stress levels produce 75-85% of the individual's maximum heart rate *(Astrand, 1974; Lavoie, 1977; and ACSM, 1978)*.

The heart rate is increased and the heart pumps more forcefully with each beat. The Blood flow to some parts of the body is increased, while it is decreased in others. Blood pressure is increased muscular tension is increased throughout the body preparing the individual for rapid activation of muscle strength and power.

Exercise increases blood pressure and pulse rate with more rigorous exercise having a larger effect both immediately and 30 minutes after the exercise. *(Roth & Roth, 2005)*.

Bartunkova et al (1979) obtained heart rates of 142 to 162 bpm for junior representative players during a 10 min game of badminton, which represented 70-80% of the predicted maximum heart rate. *Misner et al (1980)* indicared that average subject achieved a mean heart rate of 60% of the age adjusted maximal exercise heart for extended periods of tennis play. The actual extent and pattern of changes in the cardiovascular system has, therefore, been shown to vary with the type, duration, and intensity of the sport. Actual game characteristics, however, and subsequent physiological demands on the participants, have also been shown to be affected by the skill level of the players. *Docherty (1978)* found heart rates could be elevated to 80-85% of the player's PMHR during a thirty minute game of badminton and the more skilful players had significantly greater stress placed on their cardiovascular system as reflected by heart rate.

None of the peak values on the swim bench correlated with heart rate responses to game-playing. However, the mean exercise intensity correlated with the fourth quarter values of heart rate *(Konstantaki et al, 1998)*. Seasonal training improved exercise capacity and decreased resting cardiovascular parameter. *(Perini et al, 2006)*. Radial Resting pulse interval was highly correlated with systolic blood pressure during static periods, and moderately correlated with diastolic blood pressure during static periods, correlations of radial Resting pulse interval with systolic blood pressure and diastolic blood pressure during exercise and rest separately. *(Marie et al 2006)*. Playing tennis raised the players' heart rates to 68-70% of their predicted maximum heart rate (PMHR). *(Docherty, 1982).*

The purpose of this study was to investigate and compare the physiological variables in relation to performance of elite male and female gymnasts of inter-university level.

It was hypothesized that both blood pressure and heart rate of elite male and female gymnasts would rise after the performance on competitive apparatus. It was further hypothesized that there would no correlation between competitive performance of both gender and selected physiological parameters.

Material and Methods

Sample

The subjects of the study were sixty three elite male and female gymnasts (males = 32, females= 31) of inter-university level belong to different cultural background of India and who represented their respective university teams in All India Inter-university Gymnastics Championships held at Guru Nanak Dev University, Amritsar (Punjab) age raging from 17 to 25 yrs.

Keeping in view, the importance of the selected physiological variables for Gymnasts, feasibility of collection of data, legitimate time and cost involved in this study, the following variables have been selected:

1. Physiological Variables: Heart Rate, Blood pressure (Independent Variables)
2. The winning performances scores of elite male and female gymnasts serve as a dependent variable.

Criterion measures

Blood pressure (systolic and diastolic) and the heart rate, winning performance scores of elite male and female gymnasts were chosen as the criterion measures for the study.

The subjects were contacted at the site of All India Interuniversity Championships personally and their sincere cooperation was solicited. Respondents were called to a common place, when they were not busy and had enough time to spare for testing. Necessary instructions were provided to the subject before the administration of each test. Confidentiality of the responses was guaranteed so that the subjects would not camouflage their real feelings. Once the instructions are clearly understood by them, the physiological parameters were tested with the help of Physician.

Heart Rate was measured bye using stethoscope in resting condition prior to the competitions and within the 5 minutes after completion of the event.

Blood Pressure was recorded (systolic and diastolic B. P.) in resting and within 5 minutes after completion of event through a sphygmomanometer.

Performances scores of elite male and female gymnasts were obtained from the record of the inter-university competition were chosen as the criterion measures for the study.

Results and Discussion

To assess the selected physiological parameters of elite male and female Gymnasts in relation to their competitive performance, mean, standard deviation, t-ratio, F-ratio and Persons product moment correlation coefficient (r) were computed. Wherever, F-ratio was found significant, Scheffe's Test of Post-hoc Analysis was carried out to identify the significance of differences between the ordered paired means of male and female Gymnasts. The level of significance was set at. .05 level.

Table 1: Descriptive statistics of selected physiological variables of elite male and female gymnasts of inter-university level

VARIABLE	TEST	MALE GYMNASTS		FEMALE GYMNASTS	
		MEAN	SD	MEAN	SD
Heart Rate	Pre-Test	67.09	2.40	67.84	2.45
	Post-Test	132.00	19.56	124.94	16.27
Systolic BP	Pre-Test	117.56	9.02	84.26	14.35
	Post-Test	111.31	17.88	104.42	16.54
Diastolic BP	Pre-Test	88.66	6.89	66.00	7.75
	Post-Test	73.81	10.78	70.58	8.52

Table 2: significance of difference between mean scores of pre-test and post-test of physiological variables of male gymnasts of inter-university level

VARIABLE	TEST	MEAN	MD	DM	T-RATIO
Heart Rate	Pre-Test	67.91	64.09	3.48	18.40*
	Post-Test	132.00			
Systolic BP	Pre-Test	117.56	6.25	3.54	1.77
	Post-Test	111.31			
Diastolic BP	Pre-Test	88.66	14.84	2.26	6.56*
	Post-Test	73.81			

*Significant at .05 level, t.05(62) = 2.00

It is evident from Table 2, that the statistically significant differences were found between pre-test and post-test heart rate and diastolic blood pressure of inter-university level male gymnasts , as the obtained t-value of 18.40, and 6.56 respectively were much higher than the required t-value of t.05 (62) = 2.00. But insignificant differences existed between pre-test and post-test systolic blood pressure of inter-university level male gymnasts, as the obtained F-value of 1.77 was less than the required F.05 (62) = 2.00.

Table 3: significance of difference between mean scores of pre-test and post-test of physiological variables of male gymnasts of inter-university level

VARIABLE	TEST	MEAN	MD	DM	T-RATIO
Heart Rate	Pre-Test	67.84	57.09	2.95	19.31*
	Post-Test	124.94			
Systolic BP	Pre-Test	84.26	20.16	3.93	5.13*
	Post-Test	104.42			
Diastolic BP	Pre-Test	60.00	4.58	2.06	2.22*
	Post-Test	70.58			

*Significant at .05 level, t.05(60) = 2.00

Table 4: Analysis of Variance on Pre-Test of Physiological Variables of Inter-University Level Male and Female Gymnasts

Dimensions	Source of Variation	df	Sum of Squares	Mean Square	F-Ratio
Heart Rate	Between Groups	1	0.07	0.07	0.012
	Within Groups	61	358.91	5.88	
Systolic BP	Between Groups	1	17465.27	17465.27	122.49*
	Within Groups	61	8697.81	142.59	
Diastolic BP	Between Groups	1	8082.53	8082.53	150.52*
	Within Groups	61	3275.22	53.69	

*Significant at .05 level
F.05(1, 61) = 4.00

It is evident from Table 3, that the statistically significant differences were found between pre-test and post-test heart rate and systolic and diastolic blood pressure of inter-university level female gymnasts , as the obtained t-value of 19.31, 5.13, and 2.22 respectively were higher than the required t-value of t.05 (60) = 2.00.

From Table 4, It is evident that the statistically significant differences existed among inter-university level male and female gymnasts in pre-test systolic and diastolic blood pressure , as the obtained F-value of 122.49 and 150.52 were much higher than the required F.05 (1, 61) = 4.00. But insignificant differences existed among inter-university level male and female gymnasts in pre-test heart rate, as the obtained F-value of 0.012 was much less than the required F.05 (1, 61) = 4.00

Tabele 5: Analysis Of Variance on Post-Test of Physiological Variables of Inter-University Level Male and Female Gymnasts

Dimensions	Source of Variation	df	Sum of Squares	Mean Square	F-Ratio
Heart Rate	Between Groups	1	785.84	785.84	2.42
	Within Groups	61	19799.87	324.59	
Systolic BP	Between Groups	1	748.18	748.18	2.52
	Within Groups	61	18864.6	269.99	
Diastolic BP	Between Groups	1	164.47	164.47	1.74
	Within Groups	61	5778.42	94.73	

From Table 5, It is evident that the statistically insignificant differences existed among inter-university level male and female gymnasts in post-test heart rate, systolic and diastolic blood pressure , as the obtained F-value of 2.42, 2.52, and 1.74 were lesser than the required F.05 (1, 61) = 4.00.

Tabele 5: Analysis Of Variance on Post-Test of Physiological Variables of Inter-University Level Male and Female Gymnasts

Variables Correlated	Male Gymnasts	Female Gymnasts
Heart Rate vs Performance Score	-0.127	-0.365
Systolic BP vs Performance Score	-0.256	-0.238
Diastolic BP vs Performance Score	-0.068	0.008

Non-significant at .05 level, r.05 (30) = .349 (Males)

Table 6 indicates that insignificant correlation existed between pre-test heart rate - performance score followed by systolic blood pressure and diastolic blood pressure of inter-university level male gymnasts, as the obtained Pearson's Product Moment Correlation Coefficients r of -.127, -.256, and -.068 respectively were lesser than the required r.05 (30) =.349. In case of female gymnasts of inter-university level, insignificant correlation also existed between pre-test heart rate - performance score followed by systolic blood pressure and diastolic blood pressure, as the obtained Pearson's Product Moment Correlation Coefficients r of -.365, -.238, and .008 respectively were lesser than the required r.05 (29) =.355.

Table 7: Relationship between Post-Test of Physiological Variables and Competitive Performance Score of Male and Female Gymnasts of Inter-University Level

Variables Correlated	Male Gymnasts	Female Gymnasts
Heart Rate vs Performance Score	**-0.047**	**-0.533**
Systolic BP vs Performance Score	**-0.438**	**-0.051**
Diastolic BP vs Performance Score	**-0.245**	**0.053**

Non-significant at .05 level, t.05 (30) = 0.349 (Males), Non-significant at .05 level, t.05 (29) = 0.355 (Females)

Table 7 indicates that insignificant correlation existed between post-test heart rate - performance score followed by systolic blood pressure and diastolic blood pressure of inter-university level male gymnasts, as the obtained Pearson's Product Moment Correlation Coefficients r of .047, -.438, and -.245 respectively were lesser than the required r.05 (30) =.349. In case of female gymnasts of inter-university level, insignificant correlation also existed between post-test heart rate - performance score followed by systolic blood pressure and diastolic blood pressure, as the obtained Pearson's Product Moment Correlation Coefficients r of -.533, -.051, and .053 respectively were lesser than the required r.05 (29) =.355.

Discussion

When male gymnasts inter-university level were compared separately between pre-test and post-test of physiological variables, produced significant differences on heart rate and diastolic blood pressure. But they had no significant difference between pre-test and post-test of systolic blood pressure. In case of female gymnasts, they had significant differences between pre-test and post-test of heart rate, systolic and diastolic blood pressure.

The analysis of variance with both sexes' gymnasts of inter-university level and pre-test of physiological variables indicated that significant differences existed among inter-university level male and female gymnasts in their pre-test of systolic blood pressure and diastolic blood pressure. But they did not differ in their post-test of heart rate, systolic and diastolic blood pressure.

To see whether male and female gymnasts of inter-university level taken independently have differences in their correlation between performance score and selected physiological variable, it was found that male and female gymnasts produced insignificant correlation between performance score and pre-test and post of heart rate followed by systolic and diastolic blood pressure.

It was hypothesized that "both blood pressure and heart rate of elite male and female gymnasts would rise after the performance on competitive apparatus' is totally accepted, as the results of per-test and post-test motioned in Table 1.

It was further hypothesized that "there would no correlation between competitive performance of both gender and selected physiological parameters" is totally accepted, as the results of per-test and post-test motioned in Table 6 & 7.

Conclusions

1. Elite male gymnasts of inter-university level had different heart rate and diastolic blood pressure in their pre-test and post-test results. But similarity was found between pre-test and post-test systolic blood pressure of elite male gymnasts.

2. Significant differences existed between pre-test and post-test heart rate, systolic and diastolic blood pressure of elite female gymnasts of inter-university level.
3. Significant differences exhibited among elite male and female gymnasts of inter-university level in the pre-test systolic and diastolic blood pressure except heart rate.
4. Elite male and female gymnasts of inter-university level had similarity in their post-test heart rate, systolic and diastolic blood pressure.

Similar correlation existed between pre-test and post-test heart rate – winning performance score followed by systolic blood pressure and diastolic blood pressure of elite male and female gymnasts of inter-university level.

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A Study of Risk Factors: Comparison between Osteoporosis and Osteopenia in the District of Patiala

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Abstract

The purpose of the study was to compare the risk factors of Osteoporosis and Osteopenia based on age, sex, education, address, occupation, BMI, Muscle Strength, VAS, POMA, Physical activity, Diet and Medical status. A total of 396 individual were assessed for Bone mineral density (BMD). Out of these 22 Osteoporotic subjects and 22 Osteopenic subjects were selected randomly with Inclusion Criteria: Subject of both sexes, age more than 40 years, BMD suggestive of Osteoporosis and Osteopenia, Subjects who were able to walk with or without walking aid and Exclusion Criteria: Individuals who were on medication known to influence bone metabolism, Individuals undergone prior balance training, Hemiplegia, Parkinson's diseases, Polyneuropathy, Grade 4 Osteo-arthritis, People suffering from acute illness and Non-ambulatory subject. Data was collected individually which was later tabulated under 2 major groups (Osteoporosis and Osteopenia). The mean values for various risk factors namely age, sex, education, social class, BMI, total muscle strength, POMA, physical activity, dietary calcium, vitamin D & Phosphorus, Caffeine, alcohol, steroids and medical status were compared between osteoporosis and osteopenia by using paired t-test. A highly significant value was found for Bone mineral density ($t = 13.030$, $p = .000$) and use of steroids ($t = -8.450$, $p = .000$). The study highlights the crucial role played by steroids. However, this study did not reveal any significant difference for other risk factors between Osteoporosis and Osteopenia. This suggests that both Osteoporotic and Osteopenic subjects have comparable risk factors, though Osteopenic subjects have better bone mineral density than Osteoporotic subjects. It is concluded that people with use of steroids are at a higher risk to develop Osteoporosis rather than Osteopenia following which their Bone mineral density should be assessed specifically.

Keywords: Osteoporosis, Osteopenia, Bone Mineral Density

INTRODUCTION

Osteoporosis is a systemic skeletal disease characterised by low bone mass and micro-architectural deterioration of bone tissue that leads to an increased fractures susceptibility *(Faulkner et al, 1993)*. The resulting low energy fractures are a major health concern, causing great suffering to those afflicted and placing a heavy burden on the society and health care system *(Johnell & Kani, 2005)*. This silently progressive metabolic bone disease is widely prevalent in India, and Osteoporotic fractures are the common cause of morbidity and mortality in adult Indian men and women *(Gupta, 1996)*.

Direct measurements of bone density in the clinical relevant sites are necessary to determine whether the individual is suffering from osteoporosis or not. There are many kinds of equipments available now-a-days. In the present study bone densitometer named 'Osteopro' has been used to check bone

mineral density at the calcaneum which is a very commonly measured clinical site that is cost efficient and less time consuming. Diagnostic categories are usually expressed as T-scores:

Normal BMD	**1 SD below young adult**
Osteopenia	**Between 1 SD and 2.5 SD below young adult**
Osteoporosis	**2.5 SD or more below young adult**

Thus, Osteopenia is a condition where bone mineral density is lower than normal which means the bones are weak and are getting closer to a condition termed as Osteoporosis.

The incidence of Osteoporosis is the highest in women, but the incidence in men is expected to triple over the next fifty years *(Gullberg et al, 1997)*. Mortality is greater in patients who have Osteoporosis in middle aged and older population *(Lee et al, 2005)*.

Tanaka et al. did a study to analyze the risk factors for osteoporosis in men (50 years and above) and observed body mass index, present physical activity and age as independent risk factors for osteoporosis *(Tanaka et al, 2001)*. *Lau et al. (2001)* in a study in 4 Asian countries that is Singapore, Malaysia, Thailand and Philippines found low dietary calcium intake, lack of physical activity, and alcoholism to be risk factors for hip fractures. Meyer et al. in a population based matched case control study in a 50 years population at Oslo, Norway found hip fracture associated with low grip strength and decreased levels of physical activity. But, length of education and total food intake was inversely related to hip fracture *(Meyer et al, 1995)*. *Cooper et al. (1992)* in a study on age stratified random sample of white women residing at Rochester, Minnesota found Caffeine consumption by elderly women with already a calcium balance impairment as a risk factor for osteoporosis. Another study done by Van staa on inhaled corticosteroids revealed positive results of increased risk of fracture with inhaled cortico-steroids mainly at the hip and spine *(Vanstaa et al, 2001)*.

Thus, a wide variety of risk factors for osteoporosis have been found and studied till date in various parts of the world. Nevertheless, all previous studies seem to be limited to three or four risk factors. Additionally no study has been reported to compare these risk factors between osteopenia and osteoporosis. Hence, this study was aimed to compare various risk factors namely age, sex, education, social class, body mass index (BMI), total muscle strength, POMA, Physical activity, dietary calcium, Vitamin D, Phosphorus, caffeine, alcohol, steroids and medical status for osteoporosis and Osteopenia in the district of Patiala (Punjab).

Aims & Objectives

- To study the risk factors of osteoporosis based on age, sex, education, address, occupation, BMI, Muscle Strength, VAS, POMA, Physical activity, Diet and Medical status.
- To study the risk factors of osteopenia based on age, sex, education, address, occupation, BMI, Muscle Strength, VAS, POMA, Physical activity, Diet and Medical status.
- To compare the risk factors of osteoporosis and osteopenia based on age, sex, education, address, occupation, BMI,

Muscle Strength, VAS, POMA, Physical activity, Diet and Medical status.

Materials and Methods

Study Design: Double group, single measure study.

The Institutional Ethical committee approved the study. Subjects were taken from the university campus, neighboring residential colonies ,old age home and de-addiction centre and were included if they fulfilled the inclusion and exclusion criteria. A total of 396 individuals were assessed for bone mineral density (BMD) with "Osteopro", a calcaneum ultrasound bone densitometer from 29th August 2009 to 28th October 2010 at the Department of Physiotherapy, Punjabi University, Patiala (Punjab).

Out of these 22 osteoporotic subjects and 22 osteopenic subjects were selected randomly with Inclusion Criteria: Subject of both sexes, age more than 40 years, BMD suggestive of osteoporosis and osteopenia, Subjects who were able to walk with or without walking aid and Exclusion Criteria: Individuals who were on medication known to influence bone metabolism, Individuals undergone prior balance training, Hemiplegia, Parkinson's diseases, polyneuropathy, Grade 4 osteo-arthritis, People suffering from acute illness and Non-ambulatory subject. All 44 subjects voluntarily entered the study and informed consent form was obtained from each subject.

A calcaneum ultrasound bone densitometer instrument named as 'osteopro' was used for the study wherein the density of calcaneum was checked for bone mineral density testing.

Calcaneum was the choice for measurement as calcaneum bone density is closely related to bone density of vertebrae and femoral regions and 90 % of which consists of cartilage which gives us an advantage to detect osteopenia and osteoporosis easily within 15 to 20 seconds by using a osteopro which is cost efficient to the subjects and the society.

The 'osteopro' report gives the value for T- scores (% young adult), Z – score (% age matched), osteoporosis index (OI),speed of sound (SS), osteoporosis progressing ratio(OPR) and judgement for degree of danger which is shown in the graph by a red colour for osteoporosis, yellow colour for osteopenia and blue colour region for normal bone mineral density.

Data was collected individually which was later tabulated under 2 major groups (osteopenia and osteoporosis).

Results

The Paired Sample T –test has been used for this study to compare the mean between the two groups to find out the statistical difference between the two.

Table 1 shows comparison of mean values of Bone Mineral Density between osteoporotic and osteopenic subjects. A highly significant value has been found for bone mineral density (t = 13.030, p= .000).

Table 1: comparison of mean values of Bone Mineral Density between osteoporotic and osteopenic subjects

	Osteoporosis			Osteopenia					
Parameter	Mean	SD	SEM	Mean	SD	SEM	Paired sample t-test	Df	Sig. (2-tailed)
Bone Mineral Density	-3.7223	.7925	.1690	-1.7514	.5834	.1244	13.030	21	.000

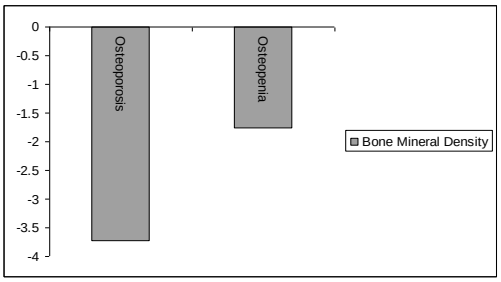

Figure 1: Bone Mineral Density of Osteoporotic & Osteopenic groups

Table – 2 shows comparison of mean values for demographic Parameters between osteoporotic and osteopenic subjects. No significant difference was found for demographic parameters of the two groups which were analysed.

Table 2: Comparison of demographic variables between Osteoporotic and Osteopenic subjects

	Osteoporosis			Osteopenia					
Parameter	Mean	SD	SEM	Mean	SD	SEM	t-test	df	Sig. (2-tailed)
Age	52.36	10.86	2.31	52.04	11.14	2.37	-0.09	21	0.92
Sex	1.50	0.51	0.109	1.64	49.24	0.11	0.90	21	0.38
Education	3.73	2.16	0.461	2.50	2.39	0.51	-1.50	21	0.15
Social	3.36	1.09	0.233	3.27	1.28	0.27	-0.23	21	0.82

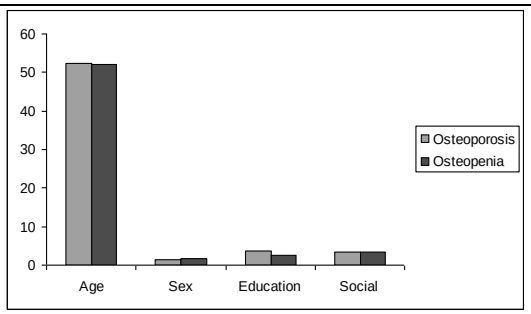

Figure 2: Comparison of demographic variables of osteoporotic and osteopenic groups

Table – 3 shows comparison of mean values of physical status between osteoporotic and osteopenic subjects. No significant values were found for physical status parameters between the two groups indicating that these parameters are common for both osteoporotic and osteopenic subjects.

Table 3: Comparison of physical status variables between Osteoporotic and Osteopenic subjects

	Osteoporosis			Osteopenia			t-test	Df	Sig. (2-tailed)
Parameter	**Mean**	**SD**	**SEM**	**Mean**	**SD**	**SEM**			
Body Mass Index	**24.99**	**3.55**	**0.76**	**25.49**	**3.10**	**0.66**	**0.45**	**21**	**0.65**
Muscle Strength	**131.42**	**43.31**	**9.23**	**143.47**	**47.28**	**10.08**	**0.88**	**21**	**0.39**
POMA	**31.73**	**6.25**	**1.33**	**29.91**	**5.92**	**1.26**	**-0.85**	**21**	**0.41**
Physical Activity	**0.55**	**0.80**	**0.17**	**0.77**	**0.87**	**0.19**	**1.23**	**21**	**0.23**

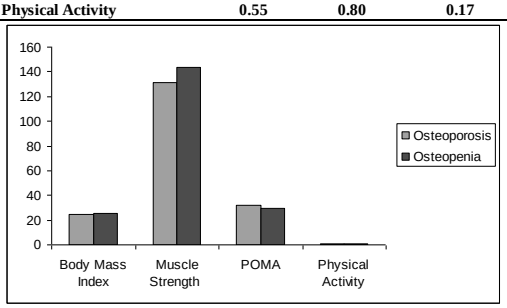

Figure 3: Comparison of BMI, muscle strength, POMA and physical activity between the osteoporotic and osteopenic groups

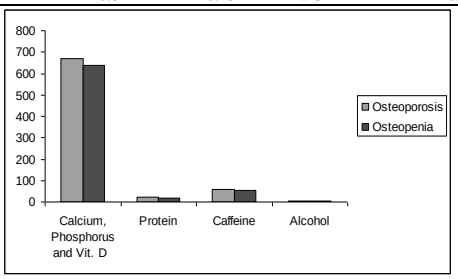

Figure 4: Comparison of dietary intakes of Ca\P\Vit D, protein, caffeine and alcohol between the osteoporotic and osteopenic groups

Table – 4 shows comparison of mean values of dietary parameters between osteoporotic and osteopenic subjects. No significant values were found for dietary parameters indicating that these parameters are common for both osteoporotic and osteopenic subjects.

Table 4:Comparison of mean dietary intakes between Osteoporotic and Osteopenic subjects

	Osteoporosis			Osteopenia			t-test	Df	Sig. (2-tailed)
Parameter	Mean	SD	SEM	Mean	SD	SEM			
Ca, P and Vit. D	669.9	354.6	75.6	639.8	339.4	72.4	-0.23	21	0.82
Protein	21.6	9.2	1.9	18.8	9.3	2.0	-0.82	21	0.42
Caffeine	60.3	20.3	4.3	55.6	16.6	3.6	-0.89	21	0.38
Alcohol	6.41.0	11.4	2.4	3.6	9.9	2.1	-0.78	21	0.45

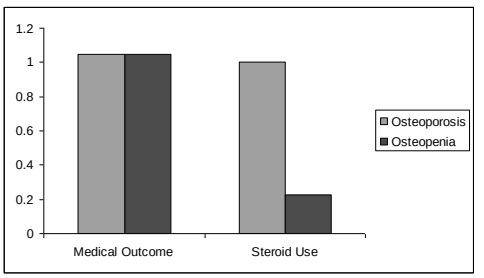

Figure 5: Comparison of medical outcome and steroid use between Osteoporotic and Osteopenic subjects

Table – 5 shows comparison of mean values for medical status between osteoporotic and osteopenic subjects. A highly significant value was found for steroid use (t= -8.450, p= .000) indicating that subjects on steroid use are at a higher risk to develop osteoporosis.

Table 2: Comparison of medical outcome and steroid use between Osteoporotic and Osteopenic subjects

	Osteoporosis			Osteopenia			t-test	Df	Sig. (2-tailed)
Parameter	**Mean**	**SD**	**SEM**	**Mean**	**SD**	**SEM**			
Medical Outcome	**1.045**	**0.99**	**0.21**	**1.05**	**0.89**	**0.19**	**0.00**	**21**	**1.00**
Steroid Use	**1.00**	**0.00**	**0.00**	**0.23**	**0.43**	**9.145E-02**	**-8.45**	**21**	**0.00**

DISCUSSION:

The comparison of osteoporotic individuals with osteopenic individuals revealed that statistically no significant difference was found for all risk factors studied in the present study except the use of steroids. Consequently, results of present study have established that risk factors for development of Osteopenia and Osteoporosis are nearly the same in nature including age, sex, education, social class, body mass index (BMI), total muscle strength, POMA, Physical activity, dietary calcium, Vitamin D, Phosphorus, caffeine, alcohol, steroids and medical status.

To the knowledge of authors, this is the first study comparing the risk factors between osteoporosis and osteopenia. Previously, Babu et al. found in their study that prevalence of Osteoporosis and Osteopenia increase steeply after the age of 50 years[11] however, it was not the comparative study. Most of the studies have been studies of risk factors with reference to bone mineral density or occurrence of fractures in patients of osteoporosis. For example, Stevenson et al. found alcohol consumption, lack of regular exercise as important risk factors in decreasing bone density and hence increasing risk of osteoporosis *(Stevenson et al, 1989)*, whereas, *Rowlands et al. (2004)* suggested that calcium intake and vigorous activity have a synergistic effect on bone mass in children. A study by *Cappuccio et*

al (1999) revealed that higher blood pressure in elderly white women is associated with increased bone loss at the femoral week which may contribute to risk of hip fractures. In a study done by Hernandez- Avila et al. on 484 U.S. women between 34-59 years found a positive relation between Caffeine intake and risk of hip fracture and alcohol intake with increased risk of hip and forearm fracture[15]. An important observation was made by Van Staa et al. stating that oral cortico-steroid therapy given in respiratory diseases increase risk of fracture at hip and spine and also stated a rapid offset of these steroids will reduce the risk of fracture at these skeletal sites simultaneously[16]. A Study done by Kanis et al. on 42,500 men and women revealed that prior and current exposure to corticosteroids confers an increased risk of fracture[17]. A study by Adinoff reveals that long term steroid therapy in asthmatic patients in associated with decreased trabecular bone density and an increased prevalence of ribs and vertebral fractures[18].

Thus, it is apparent that risk factors such as age, sex, calcium intake, alcohol consumption, lack of regular exercise, higher blood pressure, Caffeine intake and steroid therapy have been studied enormously in various parts of the world. However, no study has actually compared the level of these risk factors between osteoporosis and osteopenia.

The present study was the comparative study between osteoporosis and osteopenia, The findings highlight the crucial role played by steroids in the development of osteoporosis. However, this study did not reveal any significant difference for other risk factors between osteoporosis and osteopenia which suggests that both osteoporotic and osteopenia subjects have comparable risk factors though osteopenic subjects have a better bone mineral density than osteoporotic subjects. So, subjects on steroid medications are at a higher risk to develop osteoporosis rather than being limited to osteopenia. Additionally, the findings of present study imply that all individuals with osteopenia should be provided with appropriate therapeutic intervention so that the condition does not translate into osteoporosis.

Another important observation was that the diagnosis of bone mineral density by means of calcaneum ultrasound bone mineral densitometer is practical and economical even at the very basic community level which makes it a choice for various researches and studies including the present study.

This study also indicates that individuals who are on steroid medications prescribed for common conditions like asthma and arthritis etc. should be tested for bone mineral density at frequent and regular intervals to detect and monitor their bone mineral density to start early intervention of treatment if the detected values are lower than the normal suggested values.

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Sports Related Dental Injury – A Case Study

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Abstract

Dental emergency can happen to anyone but the athletes, both children and adults-are particularly susceptible to injuries, including those on the face, mouth and teeth. From a pain stand point, and an economic stand point it becomes an aesthetic problem and a financial problem; they have to go through many procedures to get this whole thing corrected. In the present study a case of eight year old male child with fractured upper two central incisors in an angular fashion, involving incisal half of one and incisal third of other is presented. Treatment was carried out by composite build up of the fractured segment by using composite resins. The patient was recalled at three months for clinical evaluation of the restored tooth. During the recall appointment, an assessment of the stability and longevity of the restoration was performed. Color stability, surface staining, or fracture of the composite build-up material were evaluated and found to be acceptable. The patient had no complaints about the restoration. Dentists provide trauma treatment if and when unfortunate sports-related injuries affecting the mouth, teeth and other oral tissues do occur.

Keywords: Incisor, Restoration, Composite Build up Material

INTRODUCTION

All sports activities are connected with a certain risk of orofacial injuries due to falls, collisions and contact with hard surfaces. Trauma to the anterior teeth is a common enough occurrence. The resultant manifestations are not a pleasant sight to behold: discoloured teeth due to pulp damage, intrusion, extrusion and even total luxation of the teeth and broken or fractured teeth. As neither of these is a desirable manifestation, management of different situations becomes a must so as to restore the patient to normal function and looks as soon as possible. The mental trauma alleviated in such situations is beyond compare, even though the physical discomfort is relieved as well *(Andreasen, 1993)*. A particular challenge is the restoration of fractured segments to match form and color so as to be indistinguishable from the real thing. Direct composite restorations are the most popular anterior esthetic restorative materials as they provide excellent esthetics, mechanical properties and also conserve healthy tooth structure. They are generally used as an aesthetic restoration for hypoplastic teeth, microabrasion, moderate to severe fluorosis, tetracycline staining .They are also important restorative options in fractured teeth where the loss of tooth structure is not substantial. Composite resins consist of a resin based matrix, bisphenol A-glycidyl methacrylate (BISGMA) or urethane dimethacrylate (UDMA) and inorganic filler such as silicon dioxide. The filler gives the composite wear resistance and translucency. A coupling agent such as silane is used to enhance the bond between these two components *(Tuskiboshi, 1996)*.

(1) In the present study a case of eight year old male child with fractured upper two central incisors in an angular fashion,

involving incisal half of one and incisal third of other is presented. Treatment was carried out by composite build up of the fractured segment by using composite resins.

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Figure 1: Pre –Operative

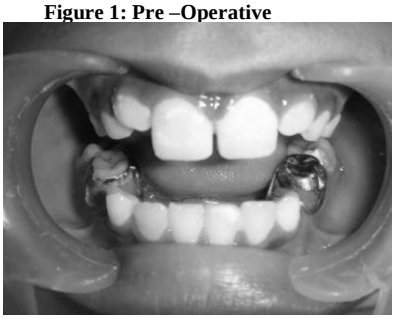

Figure 2: Post –Operative

An 8 year old male child reported to Gian Sagar Dental College, Banur with a chief complaint of broken front teeth while playing cricket (Figure 1). Clinical examination did not show any loosening, tenderness to percussion, and response to pulp testing was normal. Therefore, direct composite restoration was given in this case (Figure 2).

Prior to giving composite restorations, it is mandatory to have good preoperative photographs and accurate shade selection for best results. Shade guides should be used under proper natural light and shade selection should go well with patient's complexion and age.

The fractured surface of the tooth was prepared. Under rubber dam isolation, etchant phosphoric acid (37%) was applied to the fractured surface for fifteen seconds, washed, dried and Bond1 single step bonding agent (acetone based) was applied. After a waiting period of 30 seconds for the bonding agent to soak, the surface was gently dried and light cured for 20 seconds. Prior to giving composite restorations, good preoperative photographs and accurate shade selection was done for best results. Shade guides were used under proper natural light and shade selection was going well with patient's complexion and age.The restorative procedure was completed by building up the tooth incrementally with a direct resin composite restoration of an appropriate shade. The occlusion was carefully adjusted to avoid any primary contacts or traumatic occlusal forces to the restored tooth. Finally, the composite resin restoration was polished with a composite polishing kit.

The patient was recalled at three months for clinical evaluation of the restored tooth. During the recall appointment, an assessment of the stability and longevity of the restoration was performed. Color stability, surface staining, or fracture of the composite

build-up material were evaluated and found to be acceptable. The patient had no complaints about the restoration.

Discussion

Dental emergency can happen to anyone but the athletes, both children and adults-are particularly susceptible to injuries, including those on the face, mouth and teeth. An elbow to the mouth or a bad fall can occur unexpectedly, causing broken teeth, a torn lip, or worse, a broken jaw *Ravn (1981)*. Dental injuries suffered by professional athletes are treated slightly differently than an average person with the same type of injury.

Sports injuries to the mouth and oral environment can be disfiguring and costly, both financially and in terms of athletes' time away from school, work or training. Sports-related injuries to the mouth can become expensive, depending upon the nature and extent of the trauma. Fortunately, many sports-related injuries to the mouth can be easily prevented with properly designed mouth guard protection *Tuskiboshi (1996)*. Sports injuries to the mouth and oral tissues are not necessarily treated any differently than other traumatic injuries to the oral tissues. For instance, a sudden mishap while playing basketball could lead to injuries such as biting through the lip(s) and/or severely fracturing the front teeth. In addition, playing football could result in injuries such as losing some of the teeth as a result of blunt trauma to the face, or fractures to the upper arch of your mouth (*Stalhane & Hedegrrd, 1975)*. There are various treatment options in sports related injuries like direct composite veneers, removable partial dentures, dental bridges, dental crowns, reimplantation of avulsed tooth.

The present case report, discusses the sport related dental injury to the anterior teeth and its treatment.

Conclusion:

Dental emergency can happen to anyone but the athletes, both children and adults-are particularly susceptible to injuries, including those on the face, mouth and teeth. Dental injuries are a major problem for players, and in some cases, they are a problem for the parent of the player with the injury. From a pain stand point, and an economic stand point. It becomes an aesthetic problem, it becomes a financial problem; they have to go through many many procedures to get this whole thing corrected. Now, with the introduction of performance enhancing mouth wear, dentists also may be able to help to improve the game, too

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METHODS

RESULTS

DISCUSSION

CONCLUSION

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