

CHAPTER

FOUR : DISCUSSION AND CONCLUDING REMARKS

A. DISCUSSION

1. Age Group 2125
2. Age Group 2630
3. Age Group 3135
4. Age Group 3640
5. Age Group 4145
6. Age Group 4650
7. Age Group 5155
8. Age Group 5660

Fitness : Changes with age :

1. Body Weight
2. Heart Rate
3. ~~PEFR~~
4. B.P.
5. Steptest

B. CONCLUDING REMARKS

BIBLIOGRAPHY

STATISTICAL METHODS USED IN THE DISSERTATION



A. DISCUSSION:

to know the physical fitness of factory workers belonging to various age groups is the aim of the present investigation. As discussed previously such studies were not carried out in India. Therefore, it was very difficult to plan the programme. Although the step-test was our prime and basic test for determination of the physical fitness of the factory workers, author had also carried out various supporting physical fitness tests.

In the present study, it was found that various physical fitness levels ^{change} at various age groups of the workers. The supporting tests carried out alongwith the modified ^e step-test are resting heart rate of the workers, body height and body weight, PEFr., B.P. etc. All these tests were carried out in rest periods only because of that, it was very difficult to know these parameters in working condition without modern equipments which are not available in India, also it requires a teamwork and permission of the management.

Analysis of the data shows and gives a strong support to the statement that physical fitness goes on gradual elimination alongwith the age of factory workers. For easy understanding it is better to go through the results with reference to the age groups of the workers.

1. Age-Group: 21-25:

Most of the workers in this age groups are young energetic and active. But these workers have very less experience

of factory work. They join the factory at the age of 21 to 22 Yrs. All the parameters studied in this group show good results. The average age of this group is 22.15 ± 1.15 Yrs. The body height and body weight of the workers are not in the proportions. The workers in this group are underweighing. Average body height of this age group is 163.76 ± 5.81 Cms., whereas, body weight is 56.54 ± 3.99 Kgs. Resting heart rate of the workers is found to be better than any other age groups. Their resting heart rate is 73.76 ± 2.48 beats/min. This indicates that, the workers of this age group are on the line of good physical fitness. The blood pressure values of this age group are also normal. Systolic Blood Pressure of this age group is 121.52 ± 3.22 mmHg. and Diastolic Blood Pressure is 77.84 ± 3.05 mmHg. It shows that, diastolic B.P. is slightly below the standard mark. This gives support to their underweighing conditions. But these values fall in normal range of B.P. of this age group. Pulse-pressure of this age group is found to be 43.68 ± 4.02 mmHg. The oral temperature of the workers was examined only to find out fevering conditions and it was 97.67 ± 0.34 °F. Thus, there was very less fluctuation in the oral temperature. The PEFr values of this age group are good enough. Average PEFr of this age group is 504.8 ± 27.89 Lits/min. It shows that, PEFr fluctuations are of greater extent. This indicates that, the workers of this age group have powerful lungs. The step-test performance of this age group workers is good, 16/25 workers could perform 5 min. stepping, 8/25 performed 4 min. stepping and only 1/25 performed 3 min. stepping. 4-5

min. stepping itself shows the betterment of the workers of their working capacity. Although, the grading of step-test score falls in low average values of physical fitness, the average values of this age group are much higher i.e. 60.35 ± 6.30 .

Thus, all the results support that, the workers of the age group 21-25 have better resting heart-rate, normal B.P., better lung power. Although the workers are slightly underweighing have a good physical fitness.

2. Age-Group: 25-30:

The workers of this age group are also energetic. Average age of the workers of this age group is 29.18 ± 1.11 Yrs. Thus working experience of the workers of this age group is 8-10 Yrs. This indicates that, these workers are habituated with the factory work and work environment. They understood and realised the work and skills. All the parameters studied of the workers of this age group are found to be better than the previous age-group (21-25). The average height 165.72 ± 4.80 Cms. and body weight 57.12 ± 3.55 Kgs. shows underweighing condition of the workers. Resting heart-rate of this age group is 78.16 ± 2.30 beats/min. which is slightly higher than previous age group. The PEFR of this age group is greater by 6 lits/min. than previous age group. The PEFR of this age group is 511.2 ± 36.17 lits/min. This strengthens the view that these workers are acclimated to factory conditions. Blood pressure of the workers of this age group is slightly raised but the values are in the normal range

i.e. systolic B.P. 126.92 ± 3.26 mmHg and Diastolic B.P. 86 ± 3.41 mmHg, while pulse pressure is 40.92 ± 4.56 mmHg. The oral temperature is found to be constant 96.57 ± 0.60 °F. The performance of step-test by the workers is the best. 20/25 workers i.e. 75% workers performed 5 min. stepping and 5/25 workers performed 4 min. stepping. Thus, these workers are more physically fit than previous group workers. The step-test score of this age group is 64.34 ± 7.55 touching to the levels of high average physical fitness grade. Thus, this group shows progressive levels of physical fitness, with normal blood pressure, higher PEFR and greater physical fitness score.

3. Age-Group: 31-35:

Average age of the workers of this group is 32.94 ± 1.43 Yrs. The working experience of these workers is more than 10 Yrs. The body weight of these workers is slightly higher. Body height is 164.52 ± 5.69 Cms. and body wt. is 60.8 ± 7.84 Kgs. The resting heart rate is found to be lowered than previous group, it is 75.2 ± 2.38 beats/min. The PEFR is 510.2 ± 39.98 Lits/min. slightly lowered. Blood pressure values of this age group are found in normal range but higher than previous age-group. Systolic B.P. of this age group is 127.67 ± 4.13 mmHg. and Diastolic B.P. is 80.64 ± 3.90 mmHg. The pulse pressure is 47.12 ± 3.00 mmHg. The oral temperature is also constant i.e. 96.66 ± 0.70 °F.

Step-test performance by the workers of this age group is also better. 21/25 workers performed 5 min. stepping, whereas, rest of the workers performed 3 min. stepping. The workers

those could not performed 5 min. stepping are the cases of high blood pressure, their body weights are also higher. The step test score of this age group is 61.24 ± 10.03 . Thus, physical fitness of the workers is found to be slightly lowered than ^{the} previous age group.

4. Age-Group 36-40:

The reduction in levels of physical fitness is marked from this age group. Average age of the workers is 38.37 ± 1.37 Yrs. The experience of working of the workers is more than 15 Yrs. Thus their exposure timing to the industrial hazards is also higher. Average body height is 162.28 ± 3.49 Cms. and average body weight of the workers is 59.86 ± 4.44 Kgs. i.e. these workers are also showing the signs of underweighting. The resting heart rate is found to be increased i.e. 76.4 ± 2.16 beats/min. The peak expiratory flow rate is lowered to 508.4 ± 32.30 Lits/min. Both the systolic and diastolic blood pressure are normal. The systolic B.P. is 127.76 ± 3.75 mmHg and D.B.P. is 79.72 ± 2.79 mmHg. The pulse pressure is 48.04 ± 3.49 mmHg. The oral temperature is at constant range of 96.54 ± 0.71 °F.

The step test performance of the workers of age group 36-40 is slightly lowered than previous age group workers. 15/25 workers performed 5 min. stepping, 6/25 performed 4 min. stepping and 4/25 workers performed 3 min. stepping. This gives a clue for deterioration of the physical fitness of the workers. The step-test score of these workers is 60.63 ± 10.27 i.e. in the range of low average.

5. Age-Group 41-45:

This group of the workers also shows slowly decreasing physical fitness signs. The average age of the workers is 42.11 ± 1.07 Yrs. Average body height is 166.04 ± 5.8 Cms. and body weight is 63.04 ± 5.84 Kgs. Thus, body height and body weight is in normal proportion. The resting heart rate in these workers is quite higher than previous groups, it is 79.04 ± 2.45 beats/min. The peak expiratory flow rate of the workers of this age group is 502.8 ± 28.43 Lits/min., which is dropped down from the average PEFR values of previous groups. Blood pressure values are raised up, systolic B.P. 129.52 ± 2.78 mmHg and Diastolic B.P. is 85.28 ± 2.82 mmHg. The pulse pressure is 44.24 ± 2.10 mmHg. The oral temperature is constant 96.97 ± 0.61 °F. Stepping performance of the workers of this age group is also dropped down to 59.98 ± 7.12 . Thus these workers have high resting heart rate, high B.P. and reduced PEFR and step test score indicates their decreasing physical fitness.

6. Age Group 46-50:

Number of signs of elimination of the physical fitness of the workers are found in this age group. Age of the workers is increased to 47.46 ± 1.23 Yrs. The body weight 61.32 ± 6.35 Kgs. is slightly increased in the proportion with body-height 163.06 ± 3.67 Cms. The resting heart rate is also increased to 79.76 ± 2.02 beats/min. But the drop in peak-expiratory flow rate is more than 20 lits/min. The PEFR of the workers of this age group is 480.4 ± 41.55 Lits/min. i.e. fluctuations in the PEFR

values are greater. Both systolic and diastolic blood pressures are increased than the B.P. values of previous age group. Systolic B.P. is 131.04 ± 3.27 mmHg. Diastolic B.P. is 86.24 ± 3.88 mmHg and pulse pressure is found to be 44.8 ± 2.16 mmHg. The oral temperature of these workers is also constant i.e. 96.7 ± 0.59 °F. Although the 5 min. stepping is performed by 15/25 workers the average of the step test score is again dropped down. Step test score of this age group is 56.38 ± 7.7 in the range of low average physical fitness.

7. Age-Group 51-55:

The physical fitness of the aged workers of this age group is dropped down further. Average age is 52.146 ± 0.88 Yrs. The body height 161.5 ± 4.62 Cms. is in proportion with the body weight 59.8 ± 3.73 Kgs. The resting heart rate of these workers is remarkably increased to 82 ± 1.26 beats/min. Peak expiratory flow rate is also rapidly dropped down to 461 ± 20.59 Lits/min. The Blood pressure is increased, systolic B.P. is 132.6 ± 1.74 mmHg, diastolic B.P. is 89.6 ± 2.32 mmHg and pulse pressure is 43 ± 0.89 mmHg. The oral temperature is constant 96.52 ± 0.43 °F, Physical fitness test score is dropped down to 55.18 ± 3.03 .

8. Age-Group 56-60:

All the characteristics of physical fitness of the workers of this age group are reduced. The average age of these workers is 56.48 ± 0.56 Yrs. The body height and the body weight are found to be in proportion i.e. body height 159.7 ± 3.4 Cms. and

body weight 58.8 ± 2.37 Kgs. Resting heart rate is increased remarkably to 84.4 ± 2.65 beats/min. Thus, these workers tire early during work and recovers late after work. Blood pressure of these workers is also increased. Systolic B.P. is 137.2 ± 3.91 mmHg, diastolic B.P. is 94.4 ± 2.93 mmHg and pulse pressure is 42.8 ± 2.03 mmHg. The peak expiratory flow rate is also greatly reduced to 452 ± 12.88 Lits/min. The oral temperature is again constant i.e. 96.8 ± 0.28 °F.

Step test score is dropped down greatly, touching to the poor average of the physical fitness grades. Step test score of the workers of this age-group is 53.25 ± 2.26 . Thus this last group of the workers show very poor marks of physical fitness.

While summarising all the above results author discusses how the fitness goes on gradual decrease from age group 21-25 to 56-60 Yrs. All the tables (table No. 18 to 25) and the graphs (fig. No. 3 to 7) gives a clear idea about deterioration of the physical fitness of the factory workers with age. The effects of age on physical characteristics can be observed easily while looking the averages of each parameter. The correlation coefficient values also gives a clue about the changing parameters with age. While comparing all the age groups between one another author noticed the following statements are true. Astrand (1958) reported that, working capacity decreases with increasing age. The present investigation strengthens above statement.

1. Body Height and Body Weight:66

Although body-height has no correlation with physical

fitness, it is one of the most important parameters to know underweighing or overweighing conditions of the individuals. The present investigation shows that, workers from all the age groups are underweighing. Height is found to be negatively correlated with age ($r = -0.6692$). Body weight of the workers is found to be some-what constant around 59.66 ± 2.01 Kgs. As the body height average of the workers is 163.32 ± 2.01 Cms., it shows that, the workers are underweighing. Fig.No. 3 shows that there is slight increase in body weight of the workers upto 42 Yrs., then it decreases with age.

2. Heart-Rate:

It was difficult to assess the physical parameters of the workers in working periods without the equipments like Heart-rate monitor which is not available in our Laboratory. Therefore, the resting heart-rates were recorded which gives lot of information about the physical fitness and working capacity of the workers. Lamb (1984) reported that, resting heart rate is lower in physically fit persons. The present investigation clearly shows that resting heart rate is positively correlated with age ($r = 0.8592$) i.e. resting heart rate greatly increases with age. Fig.No.4 clearly supports that, resting heart rate greatly increases from the age of 32 Yrs. As the resting heart rate increases physical fitness decreases. Thus, workers from the age-groups 31-35, - - - 55-60 have higher resting heart rates, hence, these workers have decreasing levels of physical fitness. These workers tire early during work and recovers lately after work. Thus present

investigation also supports that, pulse rate is age related (Pang, 1984), and it increases with age resulting in deterioration of physical fitness and work capacity of the factory workers.

3. Peak Expiratory Flow Rate:

The PEFR of the workers was studied to determine their lung capacities and powers, Zhu (1986) reported that as greater the lung volume ^{is} greater is the working capacity. Present studies shown that PEFR is negatively correlated with age ($r = -0.8651$) i.e. as age increases PEFR decreases greatly. Thus the lung power decreases gradually with age. Fig.No. 5 shows that, PEFR slowly decreases from age 30 to 40 Yrs. but then it decreases rapidly from 42 Yrs. The peak values of PEFR are found in age group 26-30 i.e. 511.2 ± 36.17 Lits/min. It drops down to 452 ± 12.88 Lits/min. in age group 56-60. Thus these decreasing PEFR values represents decreasing working capacity of the workers with age. The greatest working capacity is found at the age of 26-30 Yrs.

4. Blood Pressure:

Hofman and Walter (1987) reported that, higher is the blood-pressure lower is the physical fitness. Pang (1984) also reported that, blood-pressure is age related. The results of the present study are in good agreement with the results of the earlier investigators. The positive correlation is found between B.P. and age of the workers. Fig.No. 6 clearly shows that, blood pressure increases with age. The systolic B.P. which is 121.52 ± 3.22 mmHg. at age group 21-25 increases upto 137.2 ± 3.91 mmHg.

at the age group 56-60 Yrs. The pulse pressure has no correlation with age ($r = -0.07$). Thus, increased blood pressure leads into higher resting heart rate and ultimately the lower physical fitness. The present investigation shows increasing blood pressure of the workers leads in decreasing their working capacity and physical fitness with age. As sinyor et.al. (1983) reported that, in general fitness appears to promote faster recovery, but in general recovery periods are larger in aged workers as their fitness decreases with age.

5. Step-Test:

As used by Jones and Wakefield (1987) step test was carried out for the present investigation for knowing the physical fitness of the factory workers. Step test score is also found to be negatively correlated ($r = -0.8609$) with age, i.e. score decreases rapidly with increased age. Fig.No. 7 clearly shows this rapid decrease in physical fitness score from the age group 41-45. The peak values of physical fitness score are found at age group 26-30. At this stage score is 64.34 ± 7.55 which decreases upto 53.24 ± 2.26 at age group 56-60. Although the overall average of step test score 58.92 ± 3.41 lies in the range of low average grade of physical fitness. It is also observed that, the decrease in fitness with age is faster and at the last group it is somewhat of poor average of fitness.

Thus, it is observed that, physical fitness of industrial workers deteriorates with age. As Winder et.al. (1979) reported

that, in physically fit persons there is less accumulation and faster elimination of lactic acid from the blood stream, it gives a clue that as physical fitness of workers decreases with age, lactic acid accumulation in their blood is higher and also the elimination rate of lactic acid from blood stream is slower. Thus energy requirements of such workers are greater, they also require high energy for less work. The chances of their muscles get fatiguing are higher with age. The decreasing lung power with age of the workers leads into decrease in their work capacity.

The present study shown that, the workers are more fit physically upto age of 30-35 Yrs. After that the physical fitness of the workers gradually declines with their age.

B. CONCLUDING REMARKS:

While concluding the present disertation on "A study on physical fitness of factory workers belonging to various age groups", it should be mentioned that, practically all the objectives with which the present investigation was taken up have been satisfactorily fulfilled. Thus, the present investigation describes various physiological parameters of the factory workers. Simple, reliable and easy methods are applied throughout the investigation. Number of the observation tables are given throughout this disertation to avoid the complications during the explanation. This disertation gives reliable information about the physical fitness of the factory workers native from the rural area around Karad. As very less information is available about the fitness

of the workers and presentation of the data we tried our level best to present the work. Although, the vast and complex biostatistical calculations are avoided, the calculations made and observations noted in present disseration can be easily understood. Thus, present disseration gives practically all the information about the physical fitness and its measurement of specific factory workers, which might be applicable to other factory workers also.

The resting heart rate of the workers was determined by counting the pulse rate per min. Pang (1984) reported that, resting heart rate increases with age. The present investigation also supports this view. Thus as the resting pulse rate of the workers increases with age the physical fitness of the workers decreases. Such workers having higher resting heart rate are unable to recover early after the work. The daily exercise could help such workers to reduce their resting heart rate. The PEFR of the workers in present study is found to be negatively correlated with age. This indicates weakening of the lungs with age, which reduces the working capacity of the workers. The B.P. is found to be positively correlated with age i.e. increases with age. This also results in decreased physical fitness. The step test score decreases with age and thus shows that physical fitness decreases with age. All the workers studied are graded 'low average' physical fitness. Peak values of physical fitness are found in age groups upto 31-35 but from that a rapid decrease is found in working capacity of the workers.

Thus poor physical fitness of the factory workers is ^{the} result of their higher resting heart rate, lower PEF_R, higher B.P. alongwith their less caloric poor diet, heavy continuous factory work in factory environment, industrial hazards etc.

While concluding the present disseration, author would like to state that, the present work is by no means complete. Only the few factories are studied during this investigation. Such a programme should be undertaken on large scale throughout the India. These programmes could provide comparative studies for better understanding and to know the present health status of the Indian factory workers. The studies in present investigation are carried out only in rest periods of the workers, but it is necessary to observe the physical parameters in working and recovery periods also. But it requires team-work, better equipments like Oxylog, Heart Rate Monitor, Tread Mill and permission of the management alongwith the workers response is also necessary. Preplanningⁿ of the work is also important. Biologists should be taught various biostatistical methods. The computer facilities should be given for analysing the vast outcoming data otherwise it will become headach for them to present the matter.

The present disseration also suggest the future research problem such as to determine the daily energy expenditure of the Indian factory workers. To investigate this problem the costly equipments such as Oxylog, Heart Rate Monitor (imported) and tread mill are to be required. Secondly, the effects

of various industrial hazards on the physical fitness of factory workers should be investigated separately i.e. temperature, gases, noise, chemicals and radiations. Various methods of work with less energy should be investigated and applied in factories. Imported machineries are to be made as per specification of foreign workers, and are not suitable for Indian workers, therefore suitable designs of machines should be provided to the workers. Though, all the processes are timeconsuming and expensive they will definitely help to build sound India, fit India and smiling India.

"To make an end is to make a beginning, The end is where we start from". T.S.Eliot.