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## RESEARCH ARTICLE

## Effect of Regular Physical Activity on Physical Efficiency of female subjects (Indian).

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### Abstract

Present investigation evaluated the effects of regular physical activity on Body Fitness and Cardio-respiratory responses of middle aged Women (n=100) working in rural brick field located at remote village in paschim Medinipur district and non working women (n=100) living in Medinipur (West) district town. All subjects were belongs to age group in between 35 years to 45 years. Anthropometric data of Vertical Height and Body mass of women living in District Town and rural working women were measured by Anthropometer Rod, Weighing machine and compared. Body fat percent was estimated of the subjects of both groups by Siri Equation putting the value of arm skinfold thickness and iliac skinfold thickness using Harpenden Skin Fold Calipers.  $VO_2$  max was determined by treadmill exercise with direct measurement of oxygen consumption. Pulmonary minute ventilation (VE) of the subjects of both group were measured by Electronic Spirometer. Blood Pressure was measured by Sphygmomanometer and Radial Pulse rate (beats /min) was measured. Blood Haemoglobin Concentration was measured by spectrophotometrical technique and compared. Erythrocyte count of the subjects of both rural and urban area was taken by Automatic Coulter Counter. Working(Heavy)women living in rural area had significantly higher body mass, physical efficiency and aerobic capacity than women living in urban area Nonworking women living in town area showed a significantly ( $p < 0.05$ ) lower cardio-respiratory responses to exercise than working women living in rural area. Insignificant ( $p > 0.05$ ) difference of R.B.C count, blood haemoglobin concentration (gm %) and body mass of rural subjects in respect of non working women of urban area was observed. Regular systematic exercise has some induction role in oxygen transport to tissues, oxygen uptake by tissues, muscular strength as well as physical efficiency in either sex of human beings.

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### Introduction

Health is nothing but a state of complete physical, mental developed social well beings and not merely the absence of diseases or infirmity (WHO, 1996). Good health causes better efficiency to combat the pollution tide in world. Health mainly depends on food nutrients. Deficiency of nutrients create ill health. Besides that mental pleasure is also an important factor for health condition. On the other hand anxiety, stress, man made pollutants affect the health condition of people living particularly in urban area mainly by vehicle exhaust, unburned hydrocarbons, industrial wastes, municipal sewage, nuclear wastes and water pollutants which coastally increases the concentration of Lead, Chromium, Mercury, Arsenic, Fluoride, Silicon and other toxic metals in surrounding areas (WHO, 1996; Leggett, 1993; Pocock et al., 1989; Thawley et al., 1977). Particularly Lead affects hemoglobin synthesis by inhibiting the  $\delta$ -Amino Leuvilinic Acid Synthase enzyme and creates anaemic condition. It causes lung disorder and arrest foetal

development (Lakatta, 1993; Klein et al., 1980; Granick et al., 1973). Alongside it causes fatigue condition in Urban people.

House wives living in urban area are mostly engaged in cooking only but they are not involved in any muscular activity. They depend on working women for sweeping, washing etc. Besides that they consumed in excess amount of good quality nutrients daily. As a result fat is deposited in the body and blood cholesterol level increases. The subjects are not able to do any sports activities or hard work that cause of appearance of muscular fatigue and arthritic problem in future. So, to restore the physical efficiency people should engage regularly in muscular exercise like walking, cycling, swimming for a certain period daily ignoring ageing process (Landers et al., 1994; Londeree and Hschberger, 1982., Wilmore et al., 1983). Health is related with body fitness in terms of physical efficiency and it may be expressed either by Gross efficiency or Net efficiency.

Gross Efficiency (%) = (External work output/ total energy used for work) X 100

Net Efficiency (%) = (External work output/ total energy used – Basal requirement) X 100

Mechanical Efficiency (%) = (Actual Mechanical work /input of energy) X 100

So, to restore the muscular effort, regular physical activity along with consumption of sufficient good nutrients is required.

## Materials and methods:

For present study hundred (100) rural women working in rural brick field located in remote village in Paschim Medinipur district and hundred (100) non working women living in Midnapore district town were selected. Some physiological parameters were taken on those subjects participating in exercise including Harvard Step test and Treadmill exercise. The subjects were randomly chosen and belong to middle age group (Age between 35-45 years).

Physiological parameters of such women were noted from anthropometric measurement i.e. height and weight using Standard laboratory techniques (Maiti et al., 2011). Arm circumference, Chest circumference during inspiration and expiration were also measured by standard laboratory methods (Singh and Bishnoi, 2005). Skin fold thickness of the subjects of both group were measured by Harpenden Skin fold Calipers (Jason and David, 2010). And the experimental data collected from rural and urban women group has been shown in **Table 1**.

Blood pressure (systolic and diastolic) of rural women and urban women were measured by sphygmomanometer and radial pulse rate of both groups were also recorded. Measured data has been shown in **Table 2**.

Resting and exercised heart rate of the subjects of both group were measured from carotid pulsation, maximal oxygen uptake of the subjects of both group was measured during continuous Treadmill exercise, blood haemoglobin concentration of both rural women and urban women was determined by spectrophotometrical technique. Pulmonary minute ventilation (VE) of the subjects of both group was measured by Electronic Spirometer Erythrocyte count was determined by Automatic Coulter Counter and measured data of the above experiments have been shown in **Table 3**.

## Results and Discussion:

**Table 1: Anthropometric measurements of rural brick field worker(women) and non working urban women. In each vertical column data are expressed as Mean  $\pm$  SEM.**

Variables	Rural working women (n=100)	Urban non working Women(n=100)
Age (years)	38 $\pm$ 0.46	42 $\pm$ 0.32
Height (cm)	151 $\pm$ 0.07	149. $\pm$ 0.46
Weight (Kg)	55.29 $\pm$ 0.89	52.20 $\pm$ 1.94
Arm Circumference(cm)	23.62 $\pm$ 0.60	21.00 $\pm$ 0.38
Head Circumference (cm)	51.09 $\pm$ 0.93	52.24 $\pm$ 0.30
Chest Circumference (cm)		
Inspiration	80 +1.02	73.21 $\pm$ 2.21
Expiration	74.00 $\pm$ 0.88	72.06 $\pm$ 0.78

Total Skin fold Thickness (mm)		
Iliac	9.0±0.02	8.7±0.23
Arm	5.0±0.05	8.0±0.02
% of Body Fat	18.0±0.02	21.0±0.03
$\text{Body density} = 1.0764 - (0.3081) \times \text{iliac Skin fold} - 0.3088 \times \text{Arm Skin Fold}$ $\text{Percent of body fat} = \{(4.570/\text{BD}) - 4.142\} \times 100$ $\text{Total Fat (Kg)} = (\text{Body weight (Kg)} \times \text{Percent of fat}) / 100$		

**Table 2: Heart and Lung response of Rural brick field worker (women) & non working Urban women. In vertical columns data are expressed as Mean ± SEM.**

Variables	Rural working Women (n=100)		Urban non working Women (n=100)		Level of Significance	
	Before Exercise	After Exercise	Before Exercise	After Exercise		
Blood Pressure (mm of Hg)	Systolic	126±1.31	156±2.01	132±3.32	169±1.02	P<0.05
	Diastolic	82.92±2.30	82±2.01	80.12±1.99	80±1.22	p>0.05
Pulse Rate (beats /min)	68.0±1.56	156.0±2.74	72.26±1.39	178.0±3.16		p>0.05
Breathing rate (breaths/min)	10.0± 0.26	14.0± 1.20	16 ±0.29	22.0± 1.02		P>0.05

**Table 3: Cardio-respiratory response after exercise and blood Haemoglobin concentration. In vertical columns data are expressed as Mean ± SEM.**

Variables	Rural working Women (n=100)	Urban non working Women (n=100)	Level of Significance
Resting Heart Rate (beats/min)	68.28±2.64	72.26±1.41	p>0.05
Maximum Heart Rate (beats/min)	156±2.74	178.0±3.16	P<0.05
Maximal Oxygen uptake (lit/min)	2.86±0.08	1.73±0.04	p<0.05
Pulmonary minute ventilation after exercise (VE) (lit/min)	12 ± 0.36	10± 0.13	p>0.05
Physical Fitness Index (%)	89±0.02	60±0.32	P<0.05
RBC Count (million/mm <sup>3</sup> )	4.2±0.33	4.5±0.28	P<0.05
Hemoglobin Concentration (gm%)	10.9. ±0.84	11±1.02	p>0.05

The present study showed interesting findings that physical efficiency of women may be restored if they engaged in regular physical activity ignoring ageing factor (Schulman et al., 1989). As lower concentration of oestrogen with

advancing age may affect muscular calcium metabolism that also may cause a decrement of physical efficiency in women (Armstrong et al., 1994; Aloia et al., 1991).

Our present investigation on brick field workers (women) living in rural and non-working women of urban area provides an impressive evidence that muscular efficiency can be restored by physical exercise depending on quality and quantity of food nutrients (Pocock et al., 1989; Cureton et al., 1975).

Good nutrients have an enormous role on production of sufficient energy for muscular contraction in the Physiological State of women (WHO, 1996).

But higher concentration of pollutants (lead), anxiety, stress decreases oxygenation of haemoglobin in blood and aerobic respiration of tissues of human body that also one of the reasons for lower physical efficiency of women living in urban area (National Academy of Sciences/Institute of Medicine, 2003; Granick et al., 1973).

Interesting findings in our investigation are that the measured data of body mass, arm circumference, skin fold thickness of iliac, chest circumference during expiration were higher in working women living in rural area in comparison to that data collected from non-working women living in urban area. But body fat percent and skin fold thickness of arm of non-working women of urban zone were higher than that of working women in rural area (Jason et al., 2010; Doblén, 1959) (**Table-2**).

Another finding was observed that myocardial strength, maximal oxygen uptake or vital capacity of rural brick field workers (women) were higher than that of urban non-working women (Landers and Petruzzello, 1994; Gaffney et al., 1990). Pulmonary minute ventilation (VE) and physical fitness index of rural working women was higher than that of women living in town area (Moore et al., 1982; Robinson et al., 1982). Blood haemoglobin concentration, R.B.C count of both rural women and urban women were measured but shows insignificant ( $p > 0.05$ ) variation (**Table-3**).

Regular physical exercise increases oxygen uptake capacity (Dalsky et al., 1988; Farrel et al., 1983, Klein et al., 1980), oxygenation of myoglobin and also increases oxygen consumption of muscle (Landers and Petruzzello, 1994; Leggett, 1993). In spite of regular consumption of sufficient quality nutrients women living in district town shows lower physical efficiency due to greater concentration of environmental pollutants (Leggett, 1993). The enhanced functional pulmonary ventilation of rural working women was due to partly increase in aerobic enzymes level and oxidative capacity of the ventilator muscles with physical exercise.

### Conclusion:

The overall findings in this study have revealed that the aged women are able to increase their heart rate and oxygen uptake to its maximum level as well as Pulmonary ventilation like other women belonging to lower age groups, if they involved in regular physical exercise like yoga, Meditation in a suitable environmental condition. Rise of concentration of industrial toxicants may be one of the major causes of mental disturbances, muscular fatigue and detrimental effect of physical efficiency of people living in urban area.

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