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Variation in Habitual Physical Activity of the Oraon Agricultural Labourers of Jalpaiguri District, West Bengal : Age Differences

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Abstract : It is intuitively believed and understood that an older individual of the same body size compared to an younger one is in many ways different both in structure and function. The effect of most of the determinants e.g. age, sex, body dimensions etc. on habitual physical activity is not empirically known. In the present study, Oraon agricultural labourers of Jalpaiguri district were studied to investigate the effect of age on habitual physical activity of the individual. The results both from t-statistic and ANOVA show that the age effect is one of the determining factors in habitual physical activity in either sex. Further studies are necessary to detect the threshold age of peak habitual physical activity.

INTRODUCTION

Habitual physical activity may be defined as the level and pattern of energy consumption during the usual activities of life, including both work and leisure. Habitual physical activity may differ from minute to minute, and its pattern during working days usually differs from that in leisure time and on vacation (Andersen *et al.* 1978).

Physical activity is related to the three aspects of health : physical, mental and social (WHO 1969). The survival of populations, who make their living on primitive agriculture depends upon appropriate physical fitness to cope with the consequent life-style.

Energy expenditure is known to depend on several factors related to body composition, age, sex, level and duration of physical activity, temperature, humidity, and so on. The possible effects of most of the determinants are not clearly known, especially in the actual work situation. Apparently, an older individual of the same body size compared to a younger one is in many ways different both in structure and in function. From the physiological point of view, it has been evident that a strict interrelation of different static and dynamic functions of the body based on dimensions alone does not occur. The body height is maintained constant to some extent, but body weight, heart volume increase with age. Blood volume and total amount of haemoglobin are not markedly changed. However, maximal oxygen uptake, heart rate, stroke volume, pulmonary ventilation and muscular strength decrease significantly with age (Astrand and Rodahl 1977).

There does not appear to be any specific threshold age for which physical performance deteriorates. Most of the physiological functions apparently have their own individual peak and decline with age. In most cases, the various physiological functions reach their peak somewhere between the ages of 20 and 30 years. It is apparent that most systems or functions, after reaching their peak, will level off for a period of time before gradually decreasing with age, while some decay in physical performance should be expected with advancing age (Andersen *et al.* 1978).

It has been shown that maximal aerobic power (Vo_2max) increases during childhood to reach a peak in the late teens, which is maintained untill the mid-twenties and then gradually declines. The early increase is due to the growth of muscle, heart and lungs, and the later decline is perhaps due in large part to the gradual reduction in maximum cardiac frequency observed with advancing years. Other measurements made at given level of power output do not appear to be affected by age, if the effects of sex, size and habitual activity are allowed for (Shephard 1979).

Nations which produce most of their food by human labour require most of their populations to produce food to subsist. In India, about 67.7% people are engaged in agricultural occupations and primarily depend on agriculture (Stout and Downing 1979). Both males and females are engaged in the agricultural sector and constitute an important

proportion of the total labour force in the state of West Bengal.

In view of these, the Oraon agricultural labourers of Shishubari Anchal of Jalpaiguri district, West Bengal were selected to investigate into the following : 1) Whether there is any age groupwise variation in energy expenditure measured in terms of the levels of physical activity in either sex, and 2) whether there exists any consistent trend within the age group of either sex.

MATERIAL AND METHODS

A total of 249 Oraon agricultural workers were investigated out of which 135 were male and 114 were female, and were chosen from Rangali Bazna Anchal of Madarihat Police Station, Jalpaiguri district, West Bengal.

The Oraons are a Dravidian-speaking tribal population with its major concentration in the Chotanagpur plateau in Bihar. They are believed to have migrated to northern West Bengal from Bihar about the end of the last century (Choudhury 1978). The Oraon population is inhabiting this area for a long time and practising their traditional occupation. The subjects for the present study were all adults, the age ranging between 20 and 60 years.

Habitual physical activity has been assessed by recording actual activities in terms of type, duration and intensity, and this has been done by means of retrospective (or recall) questionnaires. Energy expenditure has been calculated by multiplying the time spent in each activity by the energy cost of the activity. The daily energy expenditure has been calculated from activity records. The activity records have been taken from individuals for 7 consecutive days (Sunday through Saturday). The activity records were collected using pretested questionnaires and schedules and activities were recorded for 5 minute-durations for 24 hours a day. It was noted that there may be seasonal variation in activity pattern therefore, the peak harvesting season (end of November to middle of January) was chosen for collecting data. The subjects who volunteered themselves and could be persuaded to participate in the study were only taken in the sample.

There may be some unavoidable limitations in the study, e.g. recall lapse, and the consequent over- and under-reporting. The energy expenditure in a period of 24 hours, the total number of minutes spent in a particular activity was multiplied by a factor for that activity and respective weight of the subject, as described in the FAO/WHO/UNU report (1985). Total energy expenditure (in K.Cal) were then considered for further analysis. Taking only the types of activities, there seems to be a greater variation in the energy expenditure and time spent for each type of activities, between subjects, therefore, the types of activities were not compared and not considered for further analysis.

RESULTS

As has been mentioned earlier the 24 hours activities of the individuals were recorded and the durations for each activity were noted for analysis. Basic statistics have been calculated for each age group considering sex into account.

Table 1. *Basic statistics pertaining to energy expenditure, age-group and sexwise results*

	Male			Female		
Age-group	N	Mean	SD	N	Mean	SD
≤ 30	60	2,701.2	632.1	55	2,072.3	333.3
31-40	26	2,646.4	484.7	26	2,021.5	318.4
41-50	28	2,349.1	737.2	15	1,929.1	566.2
≥ 51	21	2,064.3	515.1	18	1,707.2	553.1

Table 1 shows the summary statistics of 4 age-groups for sexes separately. To designate all the four age groups for the present purpose the first group ≤ 30 years of age has been termed as younger adults, 31-40 age group has been termed as matured adults, 41-50 age group has been termed as middle aged adults and ≥ 51 age group is obviously older adults. In case of males, there is a sharp trend that the activity is much higher among younger adults and then the activity declines in all the subsequent age groups. In case of

females, the trend is similar to that of males but the differences are not so remarkable. The mean values of energy expenditure have been plotted in the bar graph (Fig. 1).

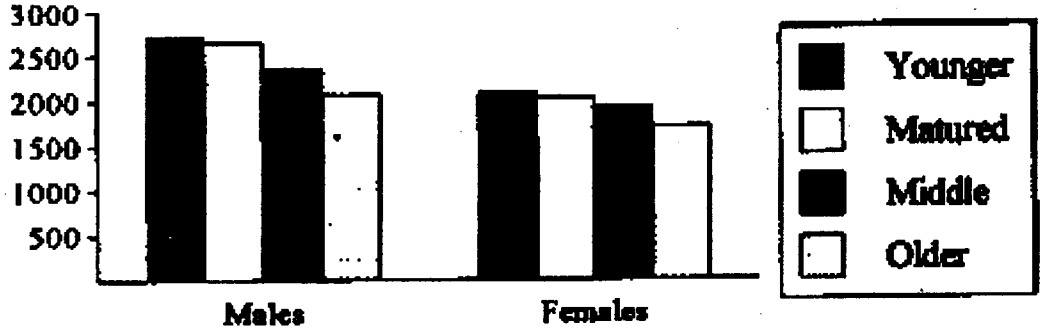

Figure 1

The comparison between means of 4 age groups of either sex expressed in terms of t-statistic have been computed (Table 2). The comparison between males show that out of six comparisons four are significant and two (younger vs matured and middle aged vs older) are non significant. Females show that out of six comparisons four are non-significant and two are significant. It is apparent from the table that difference between closer age-group are not very remarkable, difference exists particularly between distant age-groups.

Table 2. *t-statistic pertaining to age-grup comparison, separately for each sex*

Groups	Male		Female	
	t-values	df	t-values	df
Younger vs Matured	0.44	84	0.66	79
Younger vs Middle aged	2.18*	86	0.93	68
Younger vs Older	4.59**	79	2.65**	71
Matured vs Middle aged	1.76*	52	0.58	39
Matured vs Older	3.96**	45	2.17*	42
Middle aged vs Older	1.59	47	1.33	31

** Significant at 1% Level ; * Significant at 5% level

ANOVA was used for comparing the means of an arbitrary number of groups of data each of which follow a normal distribution. This will enable to determine whether the variability in energy expenditure results from variability within age groups or can truely be attributed to variability between subjects. Let us consider that there are *K*- groups with n_i observations in the *i-th* group and denote the *j-th* observation in the *i-th* group by y_{ij}. We assume that the following model holds :

$$y_{ij} = \mu + \alpha_i + e$$

Where μ is a constant represents the underlying mean of all age groups taken together, α_i is also a constant that is different for each group and represents the difference between the mean of the *i-th* group and the overall mean, e represents random error about the mean $\mu+\alpha_i$ for an individual observation from the *i-th* group, which is normally distributed with mean 0 and variance σ^2. The α_i are typically constrained in this model so that the sum of α_i's over all group is 0.

Here we assume the null hypothesis (H_0) in each of the four age groups energy expenditure are same α_i=0, alternative hypothesis (H_1) is that at least two of the four age groups energy expenditure means are not same i.e. $\alpha_i \neq 0$. Here we compute the test statistic λ, which follows an *F* distribution with *k-l* and *n-k* df under H_0. If $\lambda > F_{k-1,n-k,l-\alpha}$ then we reject H_0, but if $\lambda \leq F_{k-1,n-k,l-\alpha}$ then we accept H_0.

Table 3. *Shows the ANOVA results pertaining to age group-wise variation*

	MALE					FEMALE				
Source	df	SS	MS	F	P	df	SS	MS	F	P
Between	3	7,566,980	2,522.326	6.68	.000	3	1,890,375	630,125	3.81	.012
Within	131	49,445,328	377445			110	18,213,946	165,581		
Total	134	57,012,308	425,465			113	20,104,320	177,914		

Table 3 shows the results of ANOVA in order to find out the variation within the age groups in either sex. Males show the significant values of F-statistic and H_0 is rejected, but in case of females the F-statistic is also significant and therefore H_0 is rejected among them.

DISCUSSION

It is intutitively understood and clearly shown in the present study that habitual physical activity depends very much on the age of the individual and there is a declining trend of physical activity that has been observed towards higher age-groups. As has been mentioned earlier in the introduction about human work physiologists view that human physical working capacity reaches its peak in the late teens and is maintained untill the end of twenties depending on the childhood and growing age nutrition of the individual. Shephard *et al.* (1979) remarked that children from populations with an early puberty have a temporary advantage of absolute aerobic power and physical strength relative to those from poorer and more 'primitive' communities. In the context of habitual physical activity and ageing, Shephard (1977, 1980) also mentioned that the observed loss of physical activity inevitably reflects the combined effect of loss of function and the influence of ageing process.

In the present study, females do not show much significant difference between age-groups as observed from t-statistic as in the case of males. However, the differences in activity between males and females have not been done because of obvious natural difference that exists between males and females in terms of physique, musculature, strength and also physical activity as well. Secondly, it has been observed that males perform hard working job in the agricultural operation, while females generally perform relatively lighter works like weeding, transplanting, harvesting, etc. Such similar observation has also been reported by Das and Raha (1963). Therefore, the frequency of strenous physical activity is quite uncommon among females and variation between/among females are very minimal due to similar stereotyped job performed by them.

There are also scopes for identifying the threshold age for peak physical activity as well as to detect the age from which it declines. But in the present study, the data have been collected only from adults who have reached at least 20 years of age and the sample sizes for each age group are so small that further age wise classification is difficult. However, future studies on this aspect may be oriented keeping all these factors into consideration.

REFERENCES

ANDERSEN, K. L., R. MASIRONI, J. RUTENFRANZ and V. SELIGER 1978. *Habitual Physical Activity and Health.* Copenhagen : World Health Organization.

ASTRAND, P. O. and K. RODAHL 1977. *A Text Book of Work Physiology : Physiological Bases of Exercise.* 2nd edition. New York : McGraw-Hill Book Company.

CHOUDHURY, M. R. 1978. *The Tea Industry in India : A Diagnostic Analysis of its Geoeconomic Studies.* Calcutta : Oxford Book and Stationery Company.

DAS, A. K. and M. K. RAHA 1963. The Oraons of Sunderban. Calcutta : *Bulletin of the Cultural Research Institute,* Government of West Bengal.

FAO/WHO/UNU 1985. Energy and protein requirements. Report of a joint FAO/WHO/UNU expert committee. *WHO Technical Report Series* 724:1-206.

SHEPHARD, R. J. 1980. Population aspects of human working capacity. *Annals of Human Biology* 7:28.

SHEPHARD, R. J. 1977. *Endurance Fitness.* 2nd edition, Toronto: University of Toronto Press.

SHEPHARD R. J. 1979. Ageing, activity and fitness. Some problems in methodology. *Medcina dello Sport*, 32:69-78.

SPEPHARD, R. J., H. LAVALLEE, R. LaBARRE, J. C. JEQUIER, M. VOLLE and M. RAJIC 1979. On the basis of data standardization in pre-pubescent children, In : *Proceedings of 2nd International Seminar on Kinanthropometry*. Edited by J. Brooms. (Basel : Karger).

STOUT, B. A. and C. M. DOWNING 1979. Increasing productivity of human, animal and engine power. In : *Food Enough or Starvation for Millions*. Edited by Douglas Ensminger, pp 449-469, New Delhi : Tata McGraw-Hill publishing Company Limited.

World Health Organization 1969. International work in cardiovascular diseases. *Geneva : WHO Chronicles*, 23:8,9,10 & 11.

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