

**REPORT ON THE THESIS SUBMITTED FOR Ph. D. DEGREE OF
THE UNIVERSITY OF CALCUTTA IN PHYSIOLOGY BY Mr SRI
SAMIT KUMAR MITRA M.S.C. UNDER THE TITLE
"PHYSIOLOGICAL STUDY OF THE WORKERS ENGAGED IN
BRICK-FIELD".**

I am specially happy and proud to have been chosen as an examiner of the above mentioned thesis that is a typical product of the very respected Calcutta University School of Work Physiology. Since I am working in this field (more than 40 years), I have collected many studies which are precise and sharp descriptions of indian workers. Simultaneously, this school that is probably now the most important group of work physiology in the world has confirmed and deepened the knowledge about the physiology of man at work in general.

Coming from such a brilliant center M. Sri Samit Kumar Mitra thesis has to be considered with rather severe requirements. Even with such requirements, his thesis is quite satisfactory.

Both the scientific frame and the social demands are clearly expressed in the form of set of questions presented at the beginning of each chapter and answered at the end in a very demonstrative way. The methods are classical, justified and well related to the theoretical frame.

The author explains clearly how numerous are the workers who are engaged in the strenuous work found in brick fields. This consideration underlines the necessity of studying specially this group of workers who have not yet been subjects of a scientific evaluation.

It seems that the sample studied coming from 3 brick-fields among the 4000 found in Eastern India (West Bengal) is representative of the whole population of brick fields workers though it is of course very difficult or impossible to give a full demonstration. In fact their height (# 163 cm), their weight (20-29 years old # 50 kg, 30-39 years old 56 kg) and their $\dot{V}O_2$ max (2,20 liters minute⁻¹) and $\dot{V}O_2$ max per Kg (45 ml Kg⁻¹ minute⁻¹ for younger men, 40 ml Kg⁻¹ minute⁻¹ for elder men) are rather typical of rural indian industrial workers selected among the

farmers by the employers. The author has himself reinforced this selection in choosing "subjects with good physique as well as apparent physical fitness - willing to cooperate and having at least two years experience in the brick industry" (p. 61). We may also remark that the mean age of the sample is 30 Y with a group of young workers (mean age 25 Y) and "old" workers (mean age 36 Y) No worker older than 40 Y was considered.

We have no information about the nutrition status of these workers or their financial resources (salary, extended family) so we cannot know really if their important training has resulted in a full development of their physical capacities. We may consider that their characteristics are between those of villagers (Nag, 1981) and those of industrial workers (Sen and Sarkar, 1979).

The correlation between both height and Forced Vital Capacity (F.V.C.) is well established and the regression equation very useful.

The author gives a new demonstration of the influence of age on working capacity. It could be wise to change a little fig. 1 (p. 107) where we see the measured points in a situation not corresponding exactly to the written presentation of the results. Either these points correspond to the two means related to age groups and it would be better to see the left point at 44,60 (ml kg⁻¹ minute⁻¹ and 24,4 Y and the right point at 40,21 ml Kg⁻¹ minute⁻¹ and 35,57 Y or if the regression line has been calculated from all the data the 2 points are not necessary. This is a detail on which I may be wrong. Another remark may be related to the fact that the author has observed a rather big difference in V_O₂ between 2 groups which mean age differ only by 10 years. This difference is more important than what has been found by Nag and coll. (1980) and Nag (1981).

This result linked to the fact that no worker is aged more than 40 Y. May indicate that work in brick fields may be so strenuous that it could affect the long term health of workers. But we have not facts about the oxygen consumption during work. These data are very difficult to obtain and very rare. But we can learn in the thesis what is the global physiological load with many measurement of heart rate. This measure has the great advantage of integrating heat load. The author brings very convincing evidences of the influence of thermal environment showing striking difference between seasons and hours of the day. If the influence of heat specially on elder workers is quite classical, very convincing demonstrations of

climatic differences are rare in the literature. The results obtained by the author among brick field workers are very convincing and of utmost interest. Some results are really appalling : means of 136bp for both groups during the fifth working period at the end of the morning during summer. In the 2 last periods of the morning and the 3 last periods of the afternoon mean pulse rate is superior to 130 bpm for younger puddlers !

These data raise the question of the classification of work from the viewpoint of heaviness. It is difficult to avoid a critical reflexion about the validity of Christensen's scale in these special population activities and climate. Anyway "it is more or less universally admitted that heart beat rate should not exceed 110 beats/minute for long periods during the work day. During more intensive work periods 130 beats/minute should not be exceeded" (Wisner A., 1989, International Journal of Industrial Ergonomics, 4, 117-138).

The author has produced very interesting recovery heart rate curves. We may remark that in summer these curves are totally or partially above the safe limits (1st minute 110bpm, 2 nd 100, 3 rd 90) proposed by Brouha even for the younger green brick makers or the stackers (3rd minute).

As an ergonomist, I am always interested by the practical recommendations that may be issued after a field research. To give precise examples, I would like to refer to L. Brouha book "Physiology in industry" (1967) quoted quite rightly a few times by the author in his thesis. Brouha suggest a few directions for solutions in the case of workers overloaded by physical work and heat : breaks taken in places relatively protected from heat sources (sun), limited duration of work, hats, baths (in the neighbouring canal), availability of abundant cool, good taste drinking water. I dont know how far for these solutions are realistic in the case of West. India brick fields workers, considering economical and cultural dimensions.

I repeat my high appreciation of the thesis of Mr Samit Kumar Mitra. Reading his book has been extremely interesting and stimulating for me and I hope that the University of Calcutta will award M. Samit Kumar Mitra with Ph. D. with the highest possible appreciation.

A. Wisner, professor emeritus

