

## HABITUATION OF ELECTRO-DERMAL RESPONSES IN TENSION-HEADACHE SUFFERERS AND NON-TENSION-HEADACHE CONTROLS

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### SUMMARY

Ten tension headache sufferers (TH) were compared with ten anxious neurotics (AN) and ten normal subjects in terms of electrodermal responses habituation (RH). TH sufferers showed less impaired RH than AN group, the normals showed least impairment. Moreover, it was evident that phasic elevation of electrodermal responses, rather than tonic measure, was a better indicator of individual differences between TH and AN groups.

One of the most difficult problems in psychiatric practice is the treatment of patients complaining of recurring headache. Since headache is a symptom and not a disease, the reasons for these have to be considered in relation to the patient and the environmental set up in which his/her complaints occur. Unfortunately, very little effort has yet been given by the researchers to rigorous investigations of the pathophysiology of headache. There are various types of headache of which the present article is concerned with tension headache (TH).

Evidence bearing on the pathophysiology of tension headache is even now conflicting. Some investigators (Hart and Achanski 1975; Philips, 1977, Martin and Mathews, 1978) have found higher resting muscle tension levels in TH sufferers than non-headache controls, whilst some (Acosta *et al.*, 1978; Bakal and Maganov, 1977; Pearce, 1977) obtained non-significant differences in muscle tension between these two groups. Though several studies (Andrasik and Holroyd, 1980; Epstein and Abel, 1977) have reported no significant relationships between muscle tension levels and headache improvement, we have

not come across skin conductance (SC) measure as an index of tension and anxiety which prevail in such patients. However, in a recent study Vaughn *et al.* (1977) mentioned that in comparison with EMG, (measure of muscle-tension) SC and heart rate (HR) would provide better information about response pattern of headache and non-headache subjects to stress. But in the said study, the authors did not employ SC as a measure; failure to establish EMG as a discriminating measure made these authors to suggest that perhaps SC would be a better measure. Hence, in the present study it was decided to examine the efficacy of SC as an index of arousal while discriminating TH sufferers and non-TH controls. Furthermore, in our previous studies (Chattopadhyay *et al.*, 1975; Chattopadhyay and Das, 1982) we have found that SC and its response (GSR) habituation are by far the best in detecting the individual differences in their level of anxiety/arousal.

The purpose of the present study was to examine the nature of physiological response habituation in a group of TH sufferers when compared with non-TH controls.

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## METHODS

*Subjects :*

TH sufferers : Ten (male—5) TH patients (mean age 27.5 yrs.) were selected. Non TH controls : (a) Ten (male—5 suffering from anxiety state, mean age 26 yrs.) but free from the complaint of headache were selected.

Both groups of patients were selected randomly from a local clinic. The patients had had their first attack of illness and were free from any organic pathology. They all were drug free at the time of experimental session.

(b) Ten (male—5) post graduate students (mean age 23.5 yrs.) of the department of Psychology, Calcutta University volunteered as normal controls. They were selected randomly, were free from any neurological or psychiatric complications since childhood.

All the three groups of subjects were matched for age, sex and SES.

## MATERIALS

SC and GSR were measured using Polyrite, INCO, Chandigarh. The specification of the electrodes used and its contact medium have already been detailed elsewhere (Chattopadhyay *et al.*, 1975).

A series of 20 light flashes, each of 10  $\mu$  sec. duration and  $9.0 \times 10^5$  candles/mtr.<sup>2</sup> intensity (Chattopadhyay *et al.*, 1980) were used as visual stimuli. The inter-stimulus interval varied randomly from 45 to 80 sec. with a mean of 1 min. (Lader and Wing, 1966). The onset of each stimulus was marked by a stimulus marker on the recording chart.

*Experimental Conditions and Procedure :*

On arrival each patient was thoroughly examined by the psychiatrist of the said clinic. The diagnostic opinion of the psychiatrist about the case following the diagnostic classification of DSM II, APA 1968, was noted.

Then each patient/subject was brought into the experimental room to record SC. The detailed procedure for instrument calibration and skin conductance recording has been described elsewhere (Chattopadhyay *et al.*, 1975). To Summarise, SC was recorded for 10 minutes in resting condition which was followed by a stimulation period consisting of 20 light flashes from a stationary light source. When a subject attained the criterion of habituation recording was stopped and in case of non-habituated, the recording continued until the 20th stimuli.

*Analysis of Tracings :*

SR was read off the Polyrite tracing and was converted into log SC (in u mhos) (Lader and Wing, 1966).

GSR was obtained by subtracting the pre-stimulus log conductance from the post-stimulus log conductance value. The clear responses commencing within 6 sec. (Lader and Wing, 1966) following the start of stimulus were noted for calculating GSR. The criterion of habituation was failure to respond to three successive stimuli.

To demonstrate response habituation over time regression lines were calculated using the usual 'least-squares' method (Snedecor, 1956). In calculating regression equation the third zero response was taken as the end of the response sequence (Lader and Wing, 1966).

## RESULTS

The mean SC scores for the TH group, anxious neurotics (AN) and normals were 1.133 (uV (s.d.=0.256 uV), 0.932 uV (s.d.=0.286 uV) and 0.485 uV (s.d.=0.111 uV) respectively. The mean difference between TH and AN groups was not significant statistically. But when compared with normals both AN ( $t=4.88$ ,  $p<0.01$ ) and TH ( $t=6.03$ ,  $p<0.01$ ) groups showed significant differences indicating that both the patient groups had higher arousal than the normals.

In fig. 1 are plotted the mean GSRs for the patients and normal group as ordinate against the logarithm of stimulus number as abscissa. The equation for the mean regression lines are shown in fig. 1.

Normals on the average habituated on 10th stimulus whilst for both the patient groups even 20th stimulus was not sufficient to reach the criterion of habituation (fig. 1).

The slopes of the habituation lines were  $-0.0775$  for TH group,  $-0.0172$  for AN group and  $-0.0426$  for the normals. The differences in slopes between the groups were statistically significant. The mean differences of these values between TH and AN was  $3.306$  ( $p < 0.01$ ), between

TH and normals was  $3.125$  ( $p < 0.01$ ) and between AN and normals was  $2.89$  ( $p < 0.01$ ).

#### DISCUSSION

Since SC is a measure of arousal, individuals complaining of pathological anxiety and tension are likely to obtain higher SC than the normals. In this sense the present findings are in the expected direction indicating higher than normal arousal in the patients. Direct comparison of the present findings with those of others may not be possible since there is lack of comparable data. However, in a recent study, Neufeld and Davidson (1974) claimed superiority of EMG to SC and HR as sensitive measure of physiologic response to

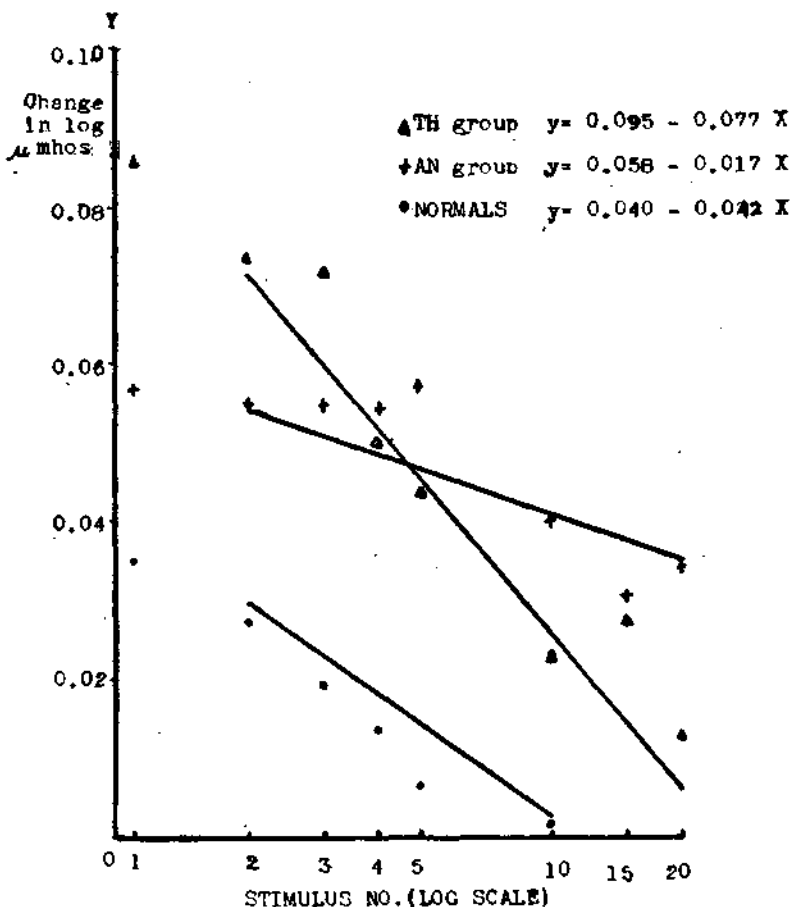


Fig. 1. Regression lines of mean GSRs of three groups

stress. But contradictory statements are also available at the moment (Vaughn *et al.*, 1977). Moreover, in Neufeld and Davidson's (1974) study TH sufferers were not examined, only post-graduate normal students acted as subjects in this study, and there too, the subjects were tested in a stress intervention experimental situation. In the present study, no such intervention of stressful situation was induced. It is not known whether the response trend would have been a different one had Neufeld and Davidson been taken TH sufferers in their study. However, the present findings of higher tension and anxiety in the TH sufferers than the non-TH control accord well with Martin and Mathews (1978) who employed EMG measure.

Response habituation (RH) being a function of one's basal arousal (Lader and Wing, 1966) and arousal and habituation being inversely related (Chattopadhyay *et al.*, 1980), the present findings of impaired response habituation in the patients are consistent with many other reported findings (Lader and Wing, 1966; Biswas and Chattopadhyay, 1981; Roy and Chattopadhyay, 1980).

The most striking aspect of the data presented is the fact that differences in the physiological indices of arousal, contrary to expectation, did not show a definite trend between AN and TH group of patients. Between group differences in patients were evident with regard to their RH. This of course, justifies that to predict individual differences in arousal RH is a more sensitive index than *SC* (basal arousal). Unfortunately, only a single parameter of physiological arousal was employed in this study. One wonders whether, having the opportunity to assess the arousal employing several indices simultaneously, similar response trend could be obtained with regard to AN and TH groups. This however, suggests the necessity of taking into account the question of 'response—specificity' (Lacey

and Lacey, 1958), an important concept which has long been emphasized to be considered in this type of research. However, the present findings of no difference in between patient groups support Acosta *et al.* (1978) and Bakal and Keganov (1977).

Physiologically, it has been hypothesized that (Acosta *et al.*, 1978) TH sufferers may differ from people without TH in terms of either tonic or phasic muscle tension levels or both. Results from the present investigation suggest that comparing with normals TH group showed differences in both tonic and phasic activity. But when compared with the AN group, phasic elevations rather than tonic measure appeared to be characteristic of TH sufferers; differences may occur because of much more heightened reactivity in the AN group during stimulation. Such physiological response characteristics of TH and AN groups need to be given the most consideration in diagnosis and treatment.

In conclusion, impaired RH was evident in the TH group than the normals. Compared with TH group, AN group showed much more impaired RH. Phasic elevations of electrodermal responses appeared to be characteristic features in differentiating between AN and TH groups.

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