

HABITUATION OF ALPHA ATTENUATION RESPONSES IN DEPRESSED PATIENTS AND NORMAL SUBJECTS

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SUMMARY

Habituation of alpha attenuation responses (AAR) obtained from a group of 20 depressed patients was compared with a group of 20 matched normal controls. The slope of the AAR habituation curve over trial showed that the normals habituated much quickly than those of patients. The findings were interpreted in terms of the level of arousal of the patients/subjects tested.

Measurement of latency and duration of the alpha attenuation response (AAR) to successive redundant stimuli has been considered as an index of central habituation (Milstein *et al.*, 1969). Research literature on habituation of AAR reported a pattern of decreasing duration of responses to repeated stimulation which tend to reach an asymptotic level (Morrell & Morrell, 1962). Wells (1963) and Milstein *et al.* (1969) obtained differences in habituation of AAR in both psychiatric and neurological patients as compared with normals. The habituation curve of the brain-damaged group diminished at a more rapid rate than did the habituation curve of the normals. Milstein & Stevens (1967) and Milstein *et al.* (1969) reported that in hospitalized schizophrenics the duration of alpha block declined exponentially and the latency increased as the experiment continued. In contrast, the legally committed schizophrenics in their study showed an initial shorter latency of responses but failed either to shorten duration of alpha blocking responses or lengthen the latency to repeated presentation of stimulus. Gastaut & Bert (1961) using rhythmically repeated visual stimulus on normal subjects obtained

rapid habituation of AAR usually between the third and the eighth presentation. Wilson & Wilson (1959), on the other hand, reported that even repeated photic stimulation for long period did only partially shorten the AAR in normal subjects, whilst in another study Erwin *et al.* (1961) demonstrated a significant decrease in duration of AAR only when serially decreased stimulus intensities were presented.

In general, however, the nature of the existing literature in this field of research gives an impression that there is dearth of studies with the problem of AAR habituation in relation to mental patients, and more so regarding those suffering from pathological anxiety and depression. Polson & Gottlieb (1961) studied the latency and duration of AAR to single flashes in a group of depressed patients and normals, but the groups did not differ in their response habituation trend. Wilson & Wilson (1961), on the other hand, found longer duration and delayed habituation of AAR in depressive than normals. Such inconsistency in the literature could be attributed to sampling bias, variability in recording technique from one laboratory to the other and so on. On the whole this inconsistency

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in the literature reflects lack of theoretical supposition regarding psychophysiological correlates of psychiatric complaints like anxiety and depression.

The purpose of the present study was to examine the nature of habituation of AAR in a group of depressive patients and to compare with those of normal subjects.

METHODS

Subjects

Twenty male patients suffering from neurotic depression (DSM II, APA, 1968), mean age 27.2 yrs., having had their first attack of illness and free from any organic pathology were tested. They were drug free at the time of testing and the mean duration of their illness was 12 months. Each patient was thoroughly examined by a psychiatrist. Subsequently, a check on diagnosis was made on MPQ, by a psychologist. When the diagnostic opinion of the psychiatrist tallied with that on MPQ, patients were taken up for the study.

Twenty post graduate students (mean age 24.3 yrs), free from any sort of psychiatric and neurological complaints, acted as normals. To rule out the possibilities of organic involvement as well as psychiatric complaints in control group all the ten normals were also selected following the same procedure as applied for the patients.

Both patients and normals were matched in age and sex.

Materials used :

- (1) Multichannel Recorder (Polyrite, INCO, Chandigarh, India) with its accessories.
- (2) Lead pad surface electrode (8 mm. diameter and 2.5 mm. thickness), (Lader, 1975).
- (3) Rubber grommet (7 mm. diameter and 14 mm. depth), (Lader, 1975).
- (4) A visual stimulus of 9.05×10^6 candles/mtr.² intensity (Chattopadhyay *et al.*, 1980).

- (5) EEG electrode jelly manufactured by INCO, Chandigarh, India.

Experimental conditions and procedure.

The subject was asked to lay down on a bed in the experimental room. External noise was controlled as far as practicable. Electrodes were fixed on O₁ and C₃ areas of the scalp (10-20 system, Jasper, 1959), cleaned with half a half ether acetone solution. Rubber grommets were fixed on each of these selected areas of the scalp and held in position using collodian gum. A necessary quantity of electrode jelly was pushed into the rubber grommets and electrodes were inserted into the grommets. The electrode were connected to the input of a INCO Low Level AC/DC amplifier which was calibrated to a EEG signal of 50 μ V/cm. at a time constant of 0.05 sec. The stimulus light was placed at a distance of 30 cm. from the glabella of the subject (Milstein, 1974). The subject was asked to close his eyes and relax. EEG was recorded in resting condition for 10 minutes. This was done to obtain a quantitative measure of his base level alpha. Subsequently a series of 20 flashes each of 10 μ sec. duration were given to the subject. The flashes were given randomly only when the alpha cycle started and three successive alpha waves of similar amplitude as that of his base level were seen on the recording chart. The paper speed was 25 mm. per sec.

Analysis of tracing

With reference to the pre stimulation alpha, at least 50% reduction in amplitude (Wilson & Wilson, 1959) subsequent to the stimulation was considered as an attenuation response. The responses were measured from the crest of the last complete alpha wave following the stimulus to the crest of the first of the next sequence of three or more alpha waves to reappear. The crest to crest distance was measured in mm. which was later converted in sec. to get the duration of AAR.

While presenting the results in graphic form, mean of each successive five responses was taken as a block and thus there were five blocks out of 20 responses obtained from each of the subjects. Such a presentation appears to give much more meaningful information than plotting in response to response manner. (Chattoopadhyay *et al.*, 1980).

RESULTS

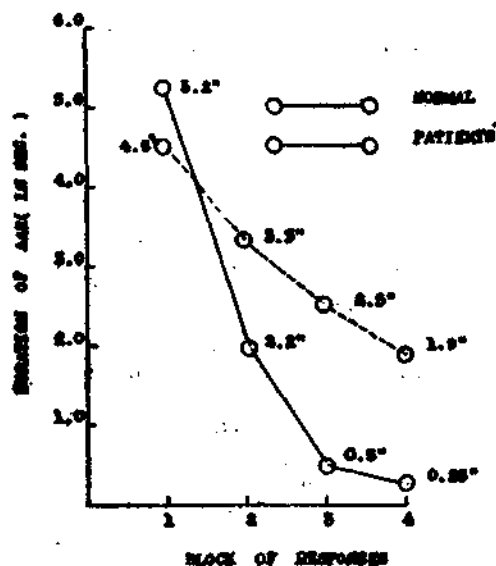


Fig. 1. Showing habituation of AAR in patients and normals.

From the figure it is evident that the slope of the AAR habituation curve over trials was much steeper in case of normals than those of patients. From the mean scores it was evident that the normals were able to regain their post stimulation alpha amplitude after the 20th. stimulus almost to the same extent as those of the pre stimulus alpha amplitude whilst for the patients such recovery was very sluggish.

DISCUSSION

At present there is lack of standard criteria in interpreting what constitutes alpha blocking and what could be the best measure of it. Early studies of AAR were mainly concerned with the determination of the 'latency' of response (Jasper & Cruikshank, 1937).

Latter workers, however, were concerned with the duration of response (e.g. Wilson & Wilson, 1959) and still later Mulholland & Gaseon (1972) and Milstein (1974), in this connection, pointed out that the latency values of AAR are found to be less reliable than the measures of duration. Hence, in the present study, the measures of duration of AAR was given importance.

From the existing literature it appears that auditory stimulation has been employed relatively less frequently than visual ones in brain potential studies. In a review, within this frame-work Bakes (1939) stated that auditory stimulation seemed to have yielded less promising observable results comparing with visual ones. Similar arguments were also put forward by Travis & Egon (1938). Therefore, in the present study, visual stimulation was preferred.

Information supplied in the literature concerning the reliability of measurement of alpha attenuation (AA) seems to be very much scattered, except for the study of Blum (1957) where a reliability of 80% was reported. Most workers (Stern *et al.*, 1961; Wells, 1963) have used subjective criteria to evaluate AA. But Knott & Henry (1961) and Visser (1961), in an attempt to quantify such measures of AA found alpha blocking as a 5% reduction in the alpha amplitude in the three or more alpha waves during a certain period of time. This, being the best available objective criterion upto now, was considered as the criterion of attenuation in the present study.

Several studies have reported (e.g. Morrell & Morrell, 1962) a pattern of decreasing duration of response to repeated stimuli tends to reach an asymptotic level. A similar response trend was much more evident in the normal subjects of the present study than those of patients. Such asymptotic nature of curve indicates that normal subjects recover very quickly from AA, whereas the patients showed much longer

recovery. There is considerable evidence at the moment (Sayer & Torres, 1966) to individual variations in response habituation due to variations in state of arousal. Habituation of AAR being a determinant of arousal (Lader & Wing, 1966) and high arousal being associated with slower response habituation, it could be said that the patients in the present study were much more aroused than the normals.

Jus & Jus (1960) concluded that AAR is unconditioned response and doesn't habituate. Several other research workers have reported either partial habituation or complete failure to obtain habituation of AAR (Roger *et al.*, 1958). Wells (1962), however, contradicted Jus & Jus's (1960) study and reported that AAR is not an 'unconditioned response'. Our present findings also support Wells (1962). Polson & Gottlieb (1961) failed to differentiate between normal and depressive patients on the basis of AAR habituation while Wilson & Wilson (1961) found longer duration and delayed habituation of AAR in depressives than normals. Our present findings, thus, add a further support to Wilson & Wilson (1961).

Rate of habituation is mainly a function of the level of CNS arousal. If the level of arousal at a particular moment is low, the intrusion of a repetitive stimulus has only a minimal effect in raising the arousal level further (Lader & Wing, 1966). Conversely, if the level of arousal is high, no habituation would be expected; instead, the level of arousal becomes even higher (Katkin & McCubbin, 1969) with successive stimulus repetition. In case of normal individuals even if a stimulus becomes stressful and his CNS arousal is raised momentarily, he tries to adapt to the situation and thereby shows a fall in his level of arousal. But a converse appears to be true in individuals having higher level of arousal. Hence, from the above theoretical consideration it may be concluded that the findings obtained in the

present study are indicative of lower arousal and rapid habituation of AAR in normals than the patients suffering from depression.

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