Phenothiazine Therapy and Perceptual Changes in Schizophrenia Patients

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Abstract

The commencement of phenothiazine therapy in acute non-paranoid schizophrenic patients was associated with turbulent perceptual changes. This finding was discussed in terms of increased sensitivity or vulnerability to sensory stimulation.

Introduction

Two methodologies, one perceptual (kinesthetic and visual figural aftereffects) and the other an EEG measure called the average evoked response, have revealed two characteristic styles: augmenting and reducing (see Barnes, 1976 for a review). An augmenter increases what is perceived; a reducer decreases what is perceived. These two methods are regarded as a measure of stimulus intensity modulation involving all sense modalities.

Using the kinesthetic figural aftereffect (KFA), the visual figural aftereffect (VFA) and average evoked response (AER), researchers have reported that acute non-paranoid schizophrenic patients are usually extreme reducers (Buchsbaum, 1975; Buchsbaum and Silverman, 1968; Kelm, 1962, 1968; Landau et al., 1975; Petrie, 1978; Schooler et al., 1976; Silverman, 1964; Wertheimer, 1954; Wertheimer and Jackson, 1957). Phenothiazine medication has been found to be associated with augmenting on both KFA and AER measures (Buchsbaum and Silverman, 1968; Inderbitzen et al., 1970; Petrie, 1978; Singer et al., 1969). The effect of phenothiazines on the VFA has not yet been investigated.

The purpose of the present investigation is to study the effect of phenothiazine medication on the VFA and test Petrie's (1978) prediction that a drug which changes a reducer to an augmenter (or vice versa) can induce a stimulus-governed perceptual style. In terms of the VFA used in the present study, a stimulus-governed style would be one in which a figure in the visual field (called the test or T figure) is phenomenally displaced a relatively great distance away from another figure (called the inspection or I figure) which the S had previously fixated. This is the usual figural aftereffect (see Koehler and Wallach, 1944) which Petrie (1978) has called augmenting because the phenomenal I - T distance has increased.

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Table 1
Summary of Analysis of Variance for the Control and Experimental groups with Three Test Times

Source	SS	df	MS	F
A: (Groups)	411.00	1	8 411.00	1015.88 0.41
Error (a)	8127.00			
B: (Test Time) A	26931.00	2	13465.50	16.85*
XB Error (b)	13227.50	2	6613.75	8.27*
Total	12789.00	16	799.31	
	61485.50	29		

*p<,005

With further exposures of the T figure (called test time), the phenomenal distance between these figures shrinks (called reducing), and has been found to lead to extreme reducing (Kelm, 1962, 1968; Kelm et al., 1963; Prysiazniuk and Kelm, 1963, 1965; Pressey and Kelm, 1966). In other words, immediately following what is called inspection time, which is visual fixation of the I figure, and the presentation of the T figure, the phenomenal distance between these figures first expands and then contracts with repeated exposures of the test figure. The stimulus-governed individual shows a greater magnitude of expansion and contraction, or augmentation and reduction, than the nonstimulus-governed person. According to Petrie, phenothiazine medication should increase the range of augmenting-reducing. The present study examines this prediction.

Subjects

Ten non-paranoid schizophrenic patients (eight had no previous history of hospitalization and two had been briefly hospitalized one month earlier) were tested within four days of admission to a psychiatric ward. At the beginning of the study none was receiving any medication. Five of these patients (3 females, 2 males, mean age 32.6 years) were tested before any therapy was begun (control group). The remaining five (3 females, 2 males, mean age 37.8 years) were started on phenothiazine medication with the type and dosage level selected by the ward physician (experimental group). Three of these patients received trifluoperazine (10 mgTID, 15 mg BID, 20 mg TID), one received thioridazine (100 mg TID) and the other chlorpromazine (100 mg QID). They were tested within one day of receiving medication.

Apparatus

The apparatus was the same as in earlier studies (Prysiazniuk and Kelm, 1965, Experiments 2 and 3; Kelm, 1968). It consisted of two wood panels, each 15 x 7.5 cms. mounted one above the other on a frame. The lower panel was stationary while the upper panel could be moved horizontally by the S turning a knob on the right-hand side of the apparatus. Movement of the upper panel could be measured accurately within .01 cms. by means of a vernier caliper mounted at the rear of the apparatus. The I and T figures, fixation point and their spatial relationships, chosen to give optimal results, were the same as in previous studies (Kelm, 1962, 1968; Pressey and Kelm, 1966; Prysiazniuk and Kelm, 1963, 1965). Each S was seated in front of the apparatus with his/her eyes 45 cms. from the figures. The E sat directly in front of S thus permitting direct observation of S's eyes (see Kelm, 1968; Prysiazniuk and Kelm, 1963, 1965).

Procedure

An office secretary who had no knowledge of VFAs or the purpose of this experiment was trained to administer the VFA test.

None of the patients knew anything about VFA phenomena.

The procedure for measuring the VFA was similar to that used earlier (Kelm, 1962, 1968; Prysiazniuk and Kelm, 1963, 1965) in which the magnitude of the VFA was measured immediately after inspection of the I figure and again 30 sec. and 60 sec. later (test time). The S was asked to keep his/her eyes on the red fixation point and turn the knob until the upper and lower lines (test figure) appeared as one straight line. Three practice alignments, each separated by one min., were made and S was asked to make each alignment within 6 to 8 sec. If any were outside this range, he/she was told to either turn faster or slower to accomplish this goal. This practice period was usually sufficient to ensure that subsequent alignments were made within 6 to 8 sec. Following a 2-min. rest the S made three more alignments, each separated by 30 sec., which were used to establish the point of subjective equality (PSE). Following another 2-min. rest, the I figure was placed in front of the T figure and S was asked to keep his/her eyes on the red dot on this card for 30 sec. (inspection time). The card was then removed and S made three alignments: immediately, 30 sec. and 60 sec. following this inspection time. These three settings constituted an experimental trial. Two more experimental trials were given, each separated by a 2-min. rest period. Two minutes after the third experimental trial, three more alignments were made, each separated by 30 sec. which were also used to establish the PSE.

Two Ss (one assigned to each of the control and experimental groups) did not maintain the required fixation on the I and T figures essential for measuring the VFA and were therefore excluded and replaced by two other patients (see Kelm, 1968; Prysiazniuk and Kelm, 1963, 1965).

Results

The six alignments, three before and three after the experimental trials, were averaged to establish the PSE. The three experimental alignments made at each of the three test times were averaged and represented the experimental alignment for each test period (immediately, 30 sec. and 60 sec. following inspection time). The difference between the mean PSE and the mean experimental settings was a measure of a S's VFA. As in the earlier studies using this method of measuring VFAs, the PSEs of the control and experimental groups were not significantly different ($p = .42$).

The VFAs at the immediate, 30 sec. and 60 sec. test times are .027, .021 and -.002 cms., respectively for the control group, and .079, -.022 and -.033 cms., respectively, for the experimental group. A summary of an analysis of variance (Edwards, 1960) is shown in Table 1. This analysis shows that there is no overall difference in augmenting-reducing between the two groups, but they differ significantly as a function of test time ($p < .005$). Also, as is usually found, there is a significant change in the VFA with test time ($p < .005$). A non-parametric analysis (Mann-Whitney U Test because of the small number of observations; Siegel, 1956) between the control and experimental groups at each of the three test times shows that the phenothiazine group augmented more than the control group in the immediate test condition ($p = .016$, one-tailed). At 30 sec. test time the experimental group switched to greater reducing than the control group ($p = .008$, two-tailed). There was no difference in the magnitude of reducing between the groups at the 60 sec. test period ($p= .32$, two-tailed).

Discussion

The results of the present study in the immediate test condition support the findings reported with the **KFA** and AER methods that phenothiazine medication is associated with augmenting (Buchsbaum and Silverman, 1968; Inderbitzen et al., 1970; Petrie, 1978; Singer et al., 1969). Petrie's (1978) prediction that a stimulus-governed perceptual style would be induced was also confirmed. Indeed, the phenothiazine group showed significantly more augmenting than the control group in the immediate test condition, but 30 sec. later showed significantly greater reducing than the control group, which is an excellent example of stimulus-governed behavior. A stimulus-governed VFA means that there are changes in the perception of size, depth, intensity and shape (Kelm, 1981).

Petrie (1978) describes the stimulus-

governed individual as one who lacks "perceptual homeostasis", and is thus experiencing a sensory environment that is expanding and contracting unpredictably. The control group which augments less than the experimental group in the immediate test condition and then reduces, as found also in other studies (Kelm, 1962, 1968), is regarded by Petrie as experiencing a barren subjective world which "...may become unbearable — not because of what it contains, but because of what it does not contain" (p. 66). The commencement of phenothiazine therapy has quickly altered this barren state, but these patients seem to lack controlled modulation which may now be one of the goals of therapy.

The stimulus-governed VFA of the phenothiazine group is similar to that found in some schizophrenic patients who obtained high scores on the Hoffer-Osmond Diagnostic Test (Kelm, 1981). High scores on this test indicate perceptual instability. Individuals with such scores have been viewed as being in a state of over-stimulation, or having a brain that is receiving too much input (Hoffer, Kelm and Osmond, 1975). Therapy for such patients should, therefore, include a reduction in sensory input. This interpretation seems to be supported by a study of university students who displayed a stimulus-governed VFA *only* when given unusually high levels of sensory input; when these levels of input were reduced, their perceptions stabilized (Kelm, unpubl., 1984).

Conclusions

The above data seem to suggest that when phenothiazine therapy is begun, the patient may be quite sensitive or vulnerable to sensory stimulation, and, therefore, sensory input should be decreased. Continued therapy could then include gradual increases in the level of the sensory environment as the patient is able to tolerate such increases, without triggering the perceptual instabilities displayed in the present study. Replication of this study and varying the levels of sensory stimulation, as well as dosage levels of medication, with repeated testings over weeks to months of continued phenothiazine therapy, could provide valuable information on the interactions of these variables.

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