

PERCEPTUAL REGULATION AND MENTAL DISORDER

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WHILE anomalies of sensory and perceptual responses characterize many mental disorders it is only recently that any serious attempt has been made to investigate them experimentally.

Prominent amongst those of recent origin are an extensive study of dark adaptation in neurotics and psychotics by Granger (1957), of colour vision in psychosis by Hardy, Rand and Rittler (1948), and of various simple and complex perceptual processes by Eysenck and his colleagues (1957).

The present study is concerned with another aspect of the perceptual response, that of input regulation as a function of the emotive level of the stimulus. To this end the research adopts a method of investigation very similar to that applied previously (Dixon, 1959; Dixon, 1960) to normals. The findings from this earlier research, which involved taking continuous measures of the visual threshold for one eye while presenting neutral and emotive material below the awareness threshold to the other eye, provided some support for the hypothesis of perceptual defence, that people unconsciously avoid or delay recognition of that which is emotionally disturbing. In a situation which excluded explanation of the results in terms of voluntary suppression, it was found that emotive material to one eye did appreciably raise the threshold as measured on the other eye. A second experiment suggested that these effects were central rather than peripheral in origin.

In extending this research to a study of abnormals we were concerned with testing three hypotheses—that the mode of perceptual regulation would differ as between normals and abnormals, that depressives would show an extreme tendency towards perceptual defence and schizophrenics the opposite tendency of vigilance.

HYPOTHESES

1. Normals differ from abnormals regarding the way in which they control the input of emotionally loaded stimulus material.
2. Endogenous and reactive depressions are characterized by perceptual defensiveness.
3. Schizophrenia is characterized by perceptual vigilance.

Subjects

There were thirty normals and eighteen abnormals. The latter were selected from in-patients of the department of psychological medicine of University College Hospital. The nine subjects in the depressive group included cases of involutional depression, those in the depressive phase of manic-depressive psychosis, and cases of reactive depression. The other nine abnormals were

paranoid schizophrenics. The diagnosis in each case was established after independent assessment by at least two and more often three psychiatrists.

APPARATUS

The apparatus consisted of two projection systems with stimulus intensity in each under control by S. In system I light from a 1,000 watt tungsten lamp T passing through the neutral log annular wedge W_1 is brought to a focus on the opal flashed glass G_1 . Light from this test patch passes through a small circular aperture in the centre of the internal face of the lummer prism P_1 , and, via the lenses L_3 and L_4 is visible from the stereoscope V. Also incident upon the inner face of the prism P_1 is light from a source A_1 passing through an opal flashed glass G_2 . Since the inner surface of the prism is, apart from the small aperture, totally reflecting it is seen from the stereoscope V as an evenly illuminated patch surrounding the central aperture. Since the motor driven wedge W_1 is under the control of the subject, via the level K, he can so vary the intensity of the test patch that it appears either darker or lighter than its surround or equal to it in brightness.

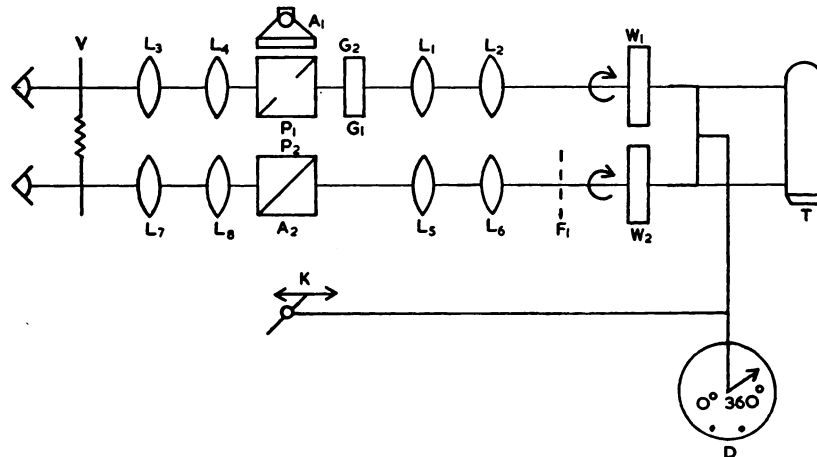


FIG. 1

The second projection system is similar to the first except that it produces an image of a word, introduced on 35 mm. film at F_1 , upon the inner face of the prism P_2 . This image being visible by the right eye through the stereoscopic system L_7, L_8 . The word is seen against an illuminated background provided by the lamp A_2 . Like the test spot presented to the left eye the image of the word can be controlled for brightness by the subject, since the annular wedge W_2 is geared to the wedge W_1 . Both these wedges are also geared to a Selson drive so that a greatly amplified measure of their movement can be read off the large dial at D. This dial is calibrated in degrees from 0° to 360° .

METHOD

Carried out in two parts, the method involved measuring S's difference threshold for the test patch during subliminal presentation to the other eye of neutral and emotional words.

In Part I S was required to hold back the control level until the dark spot disappeared because subjectively equal in brightness to the background.

In Part II he was required to hold back the lever until the spot reappeared as brighter than the background. In both parts, unknown to the S, the subliminal word presented to the other eye increased in brightness *pari passu* with the test patch.

The rationale for this method was as follows. If (a) S's threshold rose as a result of the subliminal stimulus he would let go of the control lever earlier in Part I and *later* in Part II of the experiment, because less able to discriminate a difference between either the *dark* spot or the *light* spot and its background. Conversely, if his threshold fell he would let go of the lever later in Part I and sooner in Part II.

If (b) on the other hand, he was reacting to the *increase* in brightness of the subliminal stimulus, he would, if "defensive" (that is seeking to avoid perception of the "emotional stimulus"), let go of the lever earlier in both parts of the experiment. If on the other hand, he was "vigilant" (that is seeking to perceive the "emotional stimulus") he would, to be consistent, release the lever later in both parts of the experiment.

Thus, by taking into account the S's performance in *both* parts of the experiment it was thought possible to differentiate between responses attributable to threshold changes, and those mediated by appropriate motor movements.

PROCEDURE

Seated in a dark cubicle, for a period sufficient to ensure the requisite adaptation, S was asked to look through the stereoscope at the two eye fields which, since their background brightness was the same, appeared as a single illuminated disc in the centre of which was a small black dot. S was instructed to pull the control lever releasing same when the dot disappeared.

Coincident with doing this a neutral or emotional word was exposed to the right eye at a subliminal level of brightness. When S let go of the control lever a record was made of the intensity level at which the dot disappeared before returning it to its former state as a dark spot on a lighter ground.

In Part II of the experiment, carried out immediately after Part I, the same neutral and emotional words were presented, as before, in a random order. This time, however, S was instructed to hold back the control lever until he saw the test dot disappear and then reappear as brighter than the background.

After each part of the experiment S was asked whether he had seen anything on the screen other than the test dot. In only one case did any of the Ss report seeing anything.

The stimulus material for the abnormal groups included words critical for the particular patient's psychopathology.* For the control group of normals, 22 Ss were shown the word "cancer", found from previous experiments to be effective in changing thresholds. A smaller control group of 8 Ss were shown the letters V.D. and T.B. as the emotive stimulus.

All groups were also presented with neutral control words of the same length and frequency as the emotive stimulus items.

RESULTS

It will be recalled that we are interested first in comparing normals with depressives and schizophrenics regarding mode of perceptual input regulation and secondly with comparing the latter two groups regarding the direction of

* Advised after psychiatric interview.

change as a function of stimulus meaning. To these ends the first table shows the number of subjects contributing to each of eight possible result categories.

TABLE I

	Part I		Part II		Both Parts Together			
	1 E<N	2 E>N	3 E<N	4 E>N	5 E<N	6 E<N	7 E>N	8 E>N
Depressives	8	1	0	6	0	5	1	0
Schizophrenics*	2	7	6	1	1	1	0	5
Normals	14	16	18	12	10	4	8	8

E<N signifies that the control lever was released earlier when "emotional" words were being shown than when neutral words were shown.

E>N signifies the reverse relationship between the lever responses for the two sorts of words.

* For three depressives and two schizophrenics the experiment was concluded after they had carried out Part I. These patients were too disturbed to proceed further.

From the above table it can be seen that for the normal group 18 subjects (columns 5 and 7) behaved in a way consistent with the hypothesis that they were reacting at some level to the increasing intensity of the subliminal stimulus, i.e. their lever response for the two sorts of words was the same on both parts of the experiment. Conversely 12 subjects (columns 6 and 8) behaved in a way consistent with the hypothesis that their threshold changed as a function of the stimulus content, i.e. their lever response differed between the two parts. For the schizophrenics and depressives on the other hand, it can be seen that of the thirteen who completed both parts of the experiment, eleven (columns 6 and 8) behaved in a way consistent with a change in threshold as between emotional and neutral stimuli. This latter result is significant, by the sign test, at the 3 per cent. level of confidence ($p = .0226$). In this respect, as the following table shows, these patients differed from normals to an extent that is statistically significant.

TABLE II

	Threshold Change, i.e. Lever Response the Same in Parts I and II	No Threshold Change, i.e. Lever Response Differed Between Parts I and II
Normals	18	12
Depressives and Schizophrenics ..	2	11

The difference ($\chi^2 = 7.24$) is significant at the 2 per cent. level of confidence.

The final result of interest concerns differences between the patient groups. It will be seen from Table I that five out of six of the depressive group who completed both parts of the experiment behaved in a way consistent with the hypothesis that the left eye threshold is raised when critical words are presented below threshold to the other eye.

In contrast to the depressive group, the schizophrenic group tended to show the opposite effect of lowered threshold during stimulation with critical words. Taking both parts of the experiment together, six out of seven subjects in this group behaved in a way consistent with threshold changes, five of these showing a lowered threshold response.

Referring back to the rationale for our experimental method it will be

recalled that threshold changes are implied by the following relationships between the responses in the two parts of the experiment:

Part I	Part II	
$E > N$	and	$E < N =$ lowered threshold
$E < N$	and	$E > N =$ raised threshold
		}
		for emotional words

While motor responses to the increasing intensity of the stimulus are implied by these relationships:

Part I	Part II	
$E > N$	and	$E > N =$ "seeking" emotional stimulus
$E < N$	and	$E < N =$ "avoiding" emotional stimulus

Having shown a significant tendency for abnormals to differ from normals in as much as only the former showed threshold changes it remains to compare those members of the two abnormal groups *who behaved in a way consistent with threshold change* regarding the direction of such change.

The two groups are compared in the following table:

TABLE III

	Lowered Thresholds	Raised Thresholds
Depressives	0	5
Schizophrenics	5	1

The differences between those depressives and schizophrenics, who showed threshold change, in respect of direction of such change is in fact significant at the 5 per cent. level of confidence, by the Fisher test.

DISCUSSION

On the face of it, the results from this pilot study provide some support for our two hypotheses. Regarding mode of perceptual regulation schizophrenics and depressives appear to differ from normals. Whereas the former showed changes in threshold the latter showed no such effect. On the contrary more than half of them behaved in a way equally consistent with the fact that they were responding at some level to the increasing intensity of the subliminal stimulus. They were, if anything, using a mechanism under voluntary control to avoid or to prolong experiencing the anxiety laden stimulus. Our second hypothesis, that depressives would differ from schizophrenics in direction of threshold changes, was borne out to the extent that only the former showed a consistent elevation of threshold when presented with emotionally loaded words. The schizophrenics displayed a tendency for thresholds to fall during presentation of emotional stimulus items.

However, quite apart from the fact that this was a pilot study using very small numbers of subjects, it is necessary to be cautious in interpreting these results for the very good reason that the patient groups were necessarily under treatment at the time of the experiment. Of the nine depressives six were being treated with imipramine, and of the schizophrenics six were on chlorpromazine. In other words the results from these groups could have been due to the drugs rather than to the disorder. This question is to be investigated in the course of drug trials on normal subjects at University College.

Notwithstanding this issue of whether or not they can be ascribed to drugs, the results pose several problems regarding the nature of the mechanism involved. In the first place, they suggest the presence of at least two regulatory devices whereby perceptual input is monitored and controlled.

The first would be that mediated by the voluntary nervous system and ordinarily including on its output side such responses as focusing attention, averting the eyes, turning away the head, etc. In this case it involved the response of holding on to or relinquishing a lever. The difference between this and those mentioned above was, of course, that the subject remained unaware of why he manipulated the lever as he did.

A second regulatory feedback might, it seems, be wholly automatic, proceeding both on its input and output side without cognisance by the subject. In a previous paper (Dixon, 1960) one of the authors has outlined three possible mechanisms whereby such a regulator might work. All are based on the findings from recent neurophysiological research (Gellhorn, 1954) and involve the functional relationships known to obtain between the cortex, the reticular system and the peripheral sense organs. So far as the present research is concerned, however, it remains to be seen whether our pilot findings can be confirmed on a larger sample. In this connection it is interesting that both Malmo, Shagass and Smith (1951) and Michaux (1955) have reported evidence to suggest that in schizophrenia there is a breakdown of the mechanism whereby needs are made conscious and so provoke need-satisfying conscious behaviour.

ACKNOWLEDGMENTS

We wish to thank the Consultant Staff of the Department of Psychological Medicine of University College Hospital for their generous co-operation and advice in carrying out these tests on patients under their care. Our thanks are due also to Mr. J. Chambers and Miss M. Simpson for their technical assistance.

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