RESPONSE TO STIMULUS COMPLEXITY VERSUS STIMULUS MEANING IN SCHIZOPHRENICS

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ABSTRACT

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Response to Stimulus Complexity versus Stimulus Meaning in Schizophrenics

To assess the effect of stimulus content or meaning on task performance, acute non-paranoid schizophrenics and neurotic controls were required to describe the mood portrayed in cartoon drawings which varied in terms of subject matter (human versus non-human), complexity (one human versus several humans), and affect (positive versus negative). It was found that varying the subject matter had no effect on any response measure, while increasing the complexity caused a significant drop in schizophrenics as compared with controls, in both accuracy of responses (as measured against the ratings of independent judges) and consistency of responses over two replications. Schizophrenics were also less consistent than controls in their responses to stimuli portraying negative affect, while the two groups did not differ with respect to those portraying positive affect. The data were interpreted in terms of greater response interference because of the higher level of arousal in the schizophrenic sample, it being argued that complex stimuli increased this interference directly and that stimuli portraying negative affect increased it indirectly via an increase in arousal level.

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INTRODUCTION

Many studies have examined the question of psychological deficit in schizophrenia. There has been disagreement concerning the particular aspects of a task situation which elicit impaired function. A number of theorists have argued for the importance of the content or meaning of elements in a task, suggesting that there are particular content categories on which schizophrenics show greater deficit. Opposed to this view are those who maintain that structural variables such as task complexity can adequately explain the differential performance of schizophrenics.

Bannister has taken the former position in following a line of research based on Kelly's (1955) Personal Construct theory. This theory views the maturing individual as one who forms interpretations of the world and tests these out, gradually building a representational model as a means of organizing his experiences. "Personal constructs" define the way in which a person anticipates events. Normally these are modified in the light of experience and evolve towards a stable, functional set of constructs. In this way, an individual learns to group and order objects and events in his life, and he can make inferences about new events on the basis of the system he has established. A functional construct system is one which is sufficiently flexible to adapt to change and to unexpected events, but also sufficiently precise to generate new predictions and to facilitate systematic ordered thinking.

In a series of studies, Bannister (1960, 1962, 1963, 1965) found that thought-disordered schizophrenics tended to employ an extremely "loose" construct system. The "Grid test of thought disorder" (Bannister

and Fransella, 1966) differentiated these schizophrenics from several other clinical groups on measures of intensity and consistency. The test involved rank ordering photographs of people on a number of given constructs such as mean, kind, selfish. Intensity was the measure of correlation between constructs. The low intensity which was characteristic of the schizophrenic sample indicated a failure to constellate normally similar characteristics together, and thus a lack of the conceptual structure necessary for ordered thinking. Consistency measured the stability of an individual's pattern of conceptual relationships over time, (operationally, a comparison of performance on the same grid on two separate occasions). Thought-disordered schizophrenics scored low on this measure also.

Bannister suggested that this loosening of "construing" might be the result of a history of early and/or repeated invalidations of predictions about people. Various theories concerned with the schizophrenic and his family (Bateson, Jackson, Haley & Weakland, 1956; Lidz, 1964; Laing & Esterson, 1964) take the position that the schizophrenic individual's predictions about the world, and particularly about other people, are repeatedly invalidated by family members, with the result that a loosening of linkages between his constructs occurs. While this would cushion the individual against further invalidation, it would also make it impossible for him to make clear cut or stable predictions about interpersonal events. In line with this reasoning, Bannister suggested that schizophrenic deficit would be more evident in situations where the patient is dealing with people or other affective stimuli, than with non-affective objects.

Affective Stimuli

There has been much evidence that affective stimuli disrupt performance more than do non-affective stimuli in schizophrenic subjects as compared to other psychodiagnostic groups. A number of these studies have been carried out within the framework of personal construct theory. Bannister and Salmon (1966) reported a difference between thought-disordered schizophrenics and normals in a sorting task consisting of "people" cards as stimuli, and no significant difference between the groups with "object" cards. The task was an extension of the "Grid" test. In addition to the measures of consistency and intensity, they employed an accuracy measure to determine the extent of the relationship between an individual's responses and the "normal" pattern. Salmon, Bramley and Presly (1967), using a word-in-context test found no difference between thought-disordered and non thought-disordered schizophrenic subjects in guessing the meaning of "object" words from their context, but found that the thought-disordered group were less capable at guessing the meaning of psychological words (those referring to human thought, feeling and judgment). McPherson and Buckley (1970) required schizophrenics and normals to rank photographs of people on a number of psychological and physical constructs, respectively. The two groups were differentiated on the former but not on the latter.

Williams (1971) employed a grid in which all the elements referred to people, but in different ways. He required subjects to rank order photographs of strangers, addresses of strangers, and people already well known to them, and found that the nature of the elements differentiated schizophrenics and normals. The difference was greatest

for the photographs and least for the addresses. Surprisingly, construing remembered acquaintances did not produce the greatest deficit. It was suggested that this was because there was residual structure existing for people whom the patient had known well, and that these were remembered judgments.

McPherson, Barden, Hay, Johnstone & Kushner (1970) analyzed the content of constructs used by subjects to differentiate pairs of photographs. Schizophrenics failed to use constructs which were descriptive of personality and emotional state and this kind of omission was positively related to the severity of clinically rated affective flattening.

Similar hypotheses stemming from different theoretical frameworks have been tested. Davis and Harrington (1957) compared the ability of normals and schizophrenics in solving problems involving human and non-human stimuli. The two groups were matched on their ability to solve non-human problems. The schizophrenics were significantly more disrupted by the presence of human stimuli. Whiteman (1954) found a relative deficit in his schizophrenic group in solving conceptual problem situations involving people, and no deficit when the problem situations were impersonal in nature. Dunn (1954) and Turbiner (1961) also reported a schizophrenic deficit with affective stimuli.

Some studies have concluded that schizophrenics are not differentially influenced by affective stimulation. Farina, Holzberg, and Dies (1969) found that schizophrenics functioned without deficit or great emotional disturbance following a realistic and potentially traumatic encounter with their parents. Watson (1973) compared the

quality of abstract thinking of schizophrenics and normals on proverbs tests which varied in the amount of interpersonal communication required. She found that amount of intercommunication did not differentially affect performance. In these studies it was the level of interpersonal contact which was varied, rather than the affective content of the task material itself.

In general, the majority of studies suggest that affective stimuli employed in conceptual tasks do disrupt the performance of schizophrenics. The implication is that negative or traumatic interpersonal experiences characterize the schizophrenic's life history. His inability to cope has generalized to his performance on tasks with related content. However, there are serious inadequacies in this research which preclude the conclusion that it was the affective component per se that caused the deficit. These inadequacies can be summarized under two headings: (i) defining the term "affective", and (ii) matching the selected tasks on other "non-affective" variables.

(i) "Affective stimuli" is a term that has been used with a very wide range of reference. It has been operationally defined as photographs of people (Bannister and Fransella, 1966), psychological words (Salmon et al., 1967), descriptions of situations involving people (Whiteman, 1954), and cartoon drawings of interactions between people (Dunn, 1954). Arey (1960) employed sexual and non-sexual pictures, inferring that the former had more affective loading. This lack of communality between the independent variables in these studies has made it difficult to draw general conclusions about which factor is operative.

(ii) The other problem specific to studies which claim a schizophrenic deficit with affective stimuli is the lack of comparability between the affective and non-affective components of the task. The difference in complexity between the two types of stimulus has not been adequately considered either in Bannister's work or in the other studies reviewed. Photographs of people seem more complex than photographs of objects such as bowler hats. Simple geometric designs appear less complex than drawings of people interacting. If complexity poses special problems for schizophrenics, a more parsimonious explanation than Bannister's can be offered for their relative deficit in the studies reviewed here.

Stilson, Walsmith, and Penn (1971) confirmed the finding of Davis and Harrington (1957) that schizophrenics were better able to process information when the task stimuli were diagrams rather than photographs of people. However, they attributed the differential performance of the schizophrenics to the greater amount of irrelevant information in the "human" task, arguing that it was the "noise" or complexity rather than content that differentiated the groups. A similar explanation can be offered for the other findings which have shown a deficit with affective stimuli. This explanation would be justified if it were found that complexity per se differentially disrupted schizophrenic performance, and that affective stimuli were generally more complex than non-affective stimuli. Confirmatory evidence has suggested an interference theory explanation of schizophrenic deficit with affective stimuli.

Interference Theory

Buss and Lang's (1965) formulation of this theory is that the

schizophrenic's ongoing response tendencies suffer interference from irrelevant, external cues, and from internal stimuli which consist of deviant thoughts and associations. These irrelevant cues prevent him from maintaining a clear focus on the ongoing task with psychological deficit as the result. Buss and Lang claimed that this theory could account for the particular deficit noted with affective stimuli. It assumed that the schizophrenic's associations distract him and disrupt his performance, and that the more associations there are, the greater the deficit. Evidence suggests that affective stimuli do lead to more associations (Deering, 1963), so that simply on the basis of the greater number of associations schizophrenic deficit would be predicted.

A number of versions of interference theory have attempted to describe more specifically the types of situation which lead to schizophrenic deficit, and to make inferences about aetiology. One line of research has employed the construct "overinclusion" to describe the schizophrenic's failure to separate irrelevant stimuli in a task situation. Payne, Mattussek, and George (1959), Weckowicz and Blewitt (1959), McGhie and J. Chapman (1961), Shakow (1962), and Claridge, Wawman, Davies, and Burns (1966) all used the term in a relatively unrefined form and found that acute schizophrenics were pathologically distractible. Payne and Sloane (1968) refined the term and suggested four thought-disorder syndromes as an alternative classification of schizophrenia. These were moderate retardation, severe retardation, overinclusive thinking, and overinclusive perception.

Harrow, Himmelhock, Tucker, Hersh & Quinlan (1972) went further and differentiated three types of overinclusive response, behavioral

conceptual, and stimulus. Behavioral overinclusion emphasized the quantitative aspects of a subject's overt behavior on a sorting task. Although it significantly differentiated schizophrenics from non-schizophrenics, it failed to find differences between subgroups of schizophrenics (patients in acute and non-acute phases of treatment) and the control group. Conceptual overinclusion by contrast, laid more emphasis on the qualitative aspects of a subject's thinking, and was found to be much more definitive in separating the groups. These investigators also found that those in the less acute phase of treatment showed a decrease in conceptual overinclusion. They concluded that overinclusive thinking was a prominent feature of most acute schizophrenics, partly due to the patient's general disorganization in the acute phase of the disturbance. Stimulus overinclusion, the third type mentioned, was defined as a difficulty in attending selectively to relevant stimuli. Harrow concluded from his findings that this measure was not a reliable indicator of schizophrenia.

A number of theorists have suggested that overinclusion may be secondary to a disorder of selective attention, (McGhie, 1966; Reed, 1970; Venables, 1971). They postulated a deficient filter mechanism in schizophrenics for both internal and external stimuli, which at one extreme would allow too broad attention and consequent overinclusive concepts, while excessively narrow attention would lead to the overexclusive concepts which L.J. Chapman (1961) found in more chronic patients. A deficient filter for external stimuli would lead to what Payne called overinclusive perception and Harrow called stimulus overinclusion. However, Payne, Hochberg, and Hoch

(1970) found that this overinclusive perception did not correlate significantly with overinclusive thinking in schizophrenics. Both were present more often in schizophrenics than in non-schizophrenics, but they appeared in different subgroups of the former. This implied that the disorders of attention to external stimuli could not be seen as the basis of overinclusive thinking.

However, the overinclusive thinking which has been found consistently in acute schizophrenics can still be explained as the result of a defective filter for internal stimuli, where the individual has difficulty in selecting from a number of possible responses. Broen and Storms (1967) suggested that schizophrenic deficit on a task is only consistently present when there are a number of possible responses from which a person must choose. It is response complexity which specifically creates problems for the schizophrenic and this factor is only imperfectly related to stimulus complexity. Studies varying the degree of stimulus complexity alone have yielded conflicting results. For example, Venables (1958) showed that when stimuli were easily discriminable and clearly led to specific responses, the number of stimuli in a task did not relate to amount of schizophrenic deficit. However, when response complexity was increased, schizophrenics were found to be relatively more impaired than normals, (L.J. Chapman, 1961; Lang and Luoto, 1962).

Broen and Storms' thesis was that the deficit resulting from interfering responses is related to a partial collapse of response hierarchies in schizophrenics. Dominant and competing responses to stimuli have the same hierarchical order in schizophrenics as in normals, but the strength of differing response tendencies are closer

together in the former. Thus, for example, irrelevant associations to a word reach a strength equal to those of relevant associations, and a precise discriminatory use of words becomes impossible. This theory considers the effect of the abnormal levels of arousal which have been found in schizophrenics. Broen and Storms argued that the high tonic or basal arousal shown by their schizophrenic subjects had the effect of multiplying the strength of competing responses.

Certain general conclusions can be drawn from the research outlined about the nature of the tasks causing deficit. Those situations which require subjects to decide between a number of possible responses differentiate schizophrenics and normals. Schizophrenics are less consistent in selecting the appropriate response. Increased complexity does increase deficit but this research does not indicate whether there are content variables as well which disrupt schizophrenic performance. A design is needed which separates the significant variables in tasks employing affective stimuli. If complexity rather than content leads to deficit, then an interference theory postulating some form of defective filter can serve as sufficient basis of explanation. The first aim of the present study is to test this hypothesis.

Selection of groups

In most of the research reviewed here the poor construing, etc.., has been observed when the experimental group consisted of acute, non-paranoid schizophrenics. It was this clasification which received the lowest scores on the Grid test, and it is the one employed in the present study. Some studies comparing long and short term patients have argued that chronic schizophrenics have come to terms with a confusing environment by reducing their attention to it generally, (Venables, 1971; Scherer, 1972). This implies that chronics will show this particular deficit only

on tasks where the correct response requires broader scanning. Paranoid schizophrenics tend to function more closely to normals in terms of their ability to organize and focus attention (Broen, 1968). Broen suggested that this is so because they have an organized delusional system, and thus, can impose cognitive structure.

Bannister and others working in the Personal Construct theory framework restricted their experimental group further by including only acute schizophrenics who clinically manifested thought disorder. There were several reasons for not emulating precisely their selection procedure in the present study. In a study designed to assess the validity of the Grid Test, Foulds, Hope, McPherson, and Mayo (1967) employed an undifferentiated group of schizophrenics. They found that the relationships between Grid test measures and thought disorder were specific to acute patients and to those chronic patients who showed active symptoms, and further, that they were more characteristic of non-paranoid than paranoid schizophrenics. Foulds et al. concluded that thought disorder should be viewed as a continuum in schizophrenia, which suggests that any test correlates of the disorder should also be found in those schizophrenics with less evidence of thought disorder than in Bannister's sample.

A second reason why no attempt was made to control for level of thought disorder in the present study was Poole's (1970) finding of a low positive correlation between grid scores and clinically assessed thought disorder. He suggested that this may have been a consequence of the very low level of agreement between clinicians in their assessment. Others have commented on the unreliability of

clinical assessments of thought disorder (Kreitman, Sainsbury, Morrisey, Towers, and Scrivener, 1961), and this suggests that more objective parameters should be employed in sample selection. A final reason for not singling out thought disordered schizophrenics was that a number of the studies already cited have claimed that schizophrenics, regardless of sub-type, show deficit with affective stimuli.

Positive and negative affective stimuli

A second hypothesis related to the issue of affective content derives from the work of "social censure" theorists such as Rodnick and Garmezy (1957). From this research it was inferred that schizophrenics would be differentially affected by situations resembling those which had traumatic connotations for them. Such a theory would expect task performance to differ depending on the type of situation. Dunn (1954) predicted that pictures of interpersonal scenes depicting scolding, whipping, and feeding would be emotionally disturbing to schizophrenics. A task which required subjects to rate the similarity of two such pictures was expected to be more difficult for schizophrenics than for normals. No difference was expected between the two groups on neutral material (pictures of two trees). They found that schizophrenic performance on the scolding and whipping scenes was poorer but that they were indistinguishable from normals on the feeding as well as the neutral pictures. This unexpected finding was attributed to subjects' interpretation of the feeding scene as positive and rewarding, rather than negative and threatening. Turbiner (1961) used a similar design, and although he confirmed that the two groups responded

similarly to neutral material, he found that schizophrenics were poorer than normals both on positive and negative affective stimuli.

A second line of reasoning involves the results of learning experiments which have found that, while reward is more effective for non-psychotics, punishment improves the performance of schizophrenics, (Atkinson and Robinson, 1961; Leventhal, 1959; Sermat and Greenglas, 1965). This research varies the conditions under which the material is learned rather the content variables of the task material. The assumption underlying these experiments is that the schizophrenic's reaction to reward and punishment is different because of past traumatic interpersonal relations. If negative stimuli were associated by subjects with aversive learning conditions, then the schizophrenic's performance would be expected to improve on such tasks. However, it seems that the effectiveness of reward and punishment may depend on the level of difficulty of the experimental task. Meyer and Offenbach (1962) found that in complex tasks with many alternative responses, punishment was more effective in maintaining behaviour. Since schizophrenics find complex tasks particularly difficult, their improved performance under punishment might be a secondary factor. In making inferences about the effects of punishment, level of complexity needs to be controlled.

Previous research, therefore, makes opposing predictions about the effects of direction of affect, and presents contradictory findings which are difficult to evaluate both because of inadequate control of task variables, and because of the failure of earlier studies to specify the type of schizophrenic employed. In the present study performance on positive and negative affective stimuli is observed. Interference theory would not differentiate between the two, if they are similar or equal in

complexity level. If the schizophrenic group showed greater deficit on one or the other of these, relative to the control group, this would support a theory which emphasized content.

Experimental hypotheses

Three proposals were tested in the following experiment, employing affectively-toned test material, half of which was positive in mood, and the other half negative. Some of the stimuli represented people, and of these, some had one and some had several people represented. The hypotheses were that schizophrenics and non-schizophrenics differ depending on whether the stimuli portray:

(1) people or non-people

(2) one or several people

(3) positive or negative moods.

A difference on (1), in which schizophrenics perform worse on "people stimuli", and no difference between groups on (2) would support Bannister's hypothesis about the importance of content. A difference on (2), with the more complex stimuli producing the greater schizophrenic deficit, and no difference on (1) would support interference theory. No significant difference on (3) with any type of stimulus again would support interference theory.

METHOD

Subjects

There were two groups, each of ten subjects, who were all short-term inpatients at a psychiatric hospital. They were chosen following an examination of over 100 files because they fulfilled the following criteria:

(i) Acute dysfunction in that they had no more than two previous psychiatric hospital admissions, with total length of hospitalization for all admissions not exceeding one year.

(ii) they obtained a Shipley-Hartford vocabulary scale score of 18 or above, which is equivalent to a verbal IQ of 95 or above.

(iii) there was no history or indication of neurological dysfunction.

(iv) they were between 17-50 years of age.

(v) they displayed no evidence of paranoid symptomatology.

(vi) they were English speaking.

In the experimental group the primary diagnosis at discharge was acute schizophrenia, while the control group included only non-psychotic patients. Any suggestions of schizophrenia in a subject's record were sufficient to exclude him from the latter group. Phenothiazines were the predominant medication for the schizophrenic group.

There were no significant differences between groups in age, (experimental group $\bar{X} = 24$, S.D. = 4.56; control group $\bar{X} = 29.7$, S.D. = 10.9); or in vocabulary scores, (experimental group $\bar{X} = 28.2$, S.D. = 5.75; control group $\bar{X} = 25.7$, S.D. = 5.44.)

Although the two sexes were unevenly distributed in both groups, they did not differ significantly on any of the measures taken. Bannister and Fransella (1966) found that variations in Grid Test scores were unrelated to age, sex, or vocabulary scores.

Materials

The material consisted of 18 cartoon type drawings. Six were drawings in which there was only one person portrayed (category A1, simple), six had several people portrayed (category A2, complex), and six were scenic and without people (category A3, non-people). Within each of the three categories two basic types of affect were represented, three drawings having a positive affective loading (B_1) e.g. joyful, content, etc.., and three having a negative affective loading (B_2) e.g. sad, afraid, etc.. The perceived nature of these moods had been established prior to the experiment with a normative sample (Appendix 1). Responses from this sample showed that the balance of direction of the moods was maintained across each category. Non-verbal stimuli were chosen because they elicited better cooperation from subjects, and because Bannister and Salmon (1966) employed photographs. Control of variables in the different stimulus categories was more easily achieved with drawings than with photographs.

A_2 differed from A_1 both in the number of people and in the number of moods represented. Each drawing in category A_2 portrayed several people interacting and showing one predominant mood. In each of these drawings there was one individual who differed from the other members of the group in presenting a different but essentially "neutral" mood. In this way the materials were designed to compare "people"

versus "non-people" drawings (A_{1+2} vs. A_3), simple versus complex (A_1 vs. A_2), and positive versus negative affect (B_1 vs. B_2).

Procedure

Each subject was tested individually on two consecutive days. On the first day subjects were given the following instructions:

> " I am going to show you a series of pictures, cartoon drawings. As you know, different people get different impressions from pictures and I want to find out the main impression that strikes you as you look at each of these drawings. I would like you to give the one word that best describes the mood conveyed to you by the drawing, then a second word that next best describes it, and then a third. What we will have then, for each picture, is a list of three adjectives in the order in which they describe the mood as you see it."

Following this they were asked if they understood the task. These instructions were paraphrased when clarification was needed. The drawings were handed singly to subjects in random order and the experimenter copied down the responses. On the second day subjects were first given the Shipley Institute of Living Scale to complete, and were then asked to give responses to the drawings as on the first day. They were asked to respond to the drawings as they saw them at that moment, and their responses were recorded as before. A few subjects, from both groups, were unable to give three responses to every drawing. Under these circumstances, the mean score for the two responses given was taken as the third score.

Scoring

Two judges operated independently in scoring responses on three separate measures, accuracy, intensity, and consistency. Accuracy measured the amount of agreement between the responses of subjects

on the first day and the responses obtained from the normative sample. In this normative study, the predominant responses to each drawing were determined and weighted (Appendix A). Subjects' responses to the drawings were compared with the norms and assigned a score accordingly (Appendix B). Scores of zero to five were assigned to each of a subject's three words for each drawing, depending on how closely they conformed to the norm. This measure of accuracy was intended to pick up the idiosyncratic responses of schizophrenics. Intensity measured the amount of agreement among the three words on the first testing day. A high intensity score (maximum ten for each drawing), signified that all three words conveyed the same mood. Consistency measured the amount of agreement between a subject's responses to drawings on the two consecutive days. A score approaching ten indicated high consistency. Appendix B gives the scoring criteria for all three measures.

The objectivity of the scoring method was tested by comparing the scores assigned to each subject by each of the two scorers. A Spearman Rank Correlation Coefficient was calculated for each of the three categories of stimulus within each of the three dependent variables. Correlations were significant at the .01 level in every case, (Table 1).

Table 1

Correlation Coefficients of Ranks assigned to N = 20 Subjects by Two Scorers.

	Accuracy	Intensity	Consistency
Category A_1	.90	.70	.88
Category A_2	.69	.73	.76
Category A_3	.88	.70	.84

RESULTS

Accuracy

Mann-Whitney U-tests yielded no significant differences in accuracy between groups on any category of stimulus, when absolute scores were compared. The relative change in performance across categories for schizophrenics compared with neurotic controls was then assessed, following the method employed by Bannister and Salmon, (1966). This involved taking the differences between each subject's scores on two categories, and then comparing the obtained scores for each group by applying the Mann-Whitney U-test.

There was no significant difference between groups in the amount of change from "people" to "non-people" categories, (A_{1+2} to A_3), (Table 2). The two groups did differ significantly in the amount of change shown from simple to complex categories, (A_1 to A_2), ($p < .01$, one-tailed), (Table 3). The schizophrenic group mean decreased sharply on the complex drawings, and while the control group scored lower than schizophrenics on the simple drawings, their mean score increased slightly on the complex ones.

There were no significant differences between groups on levels of B, (positive and negative affect).

Intensity

This measure yielded no significant differences between groups on any category of stimulus.

Table 2

Mean Scores: People-Non-People (Accuracy)

	A_{1+2}	A_3
Schizophrenic	22.8	26.1
Control	22.6	27.6

Table 3

Mean Scores: Simple-Complex (Accuracy)

	A_1	A_2
Schizophrenic	25.1	20.4
Control	22	23.2

$P < .01$

Consistency

The only absolute difference in consistency between groups was on category A2, (complex), ($p<.05$, one-tailed), (Table 4).

In considering relative change there was no significant difference between groups from "people" to "non-people" categories, (Table 4). Schizophrenics changed significantly more than neurotic controls between A_1 and A_2, ($p<.05$, one-tailed), (Table 5). While the groups were similar with simple drawings, schizophrenics showed a decrease on the complex ones.

On this measure alone, the direction of affect had a differential effect on groups. A direct comparison of scores showed a tendency for schizophrenics to score lower than controls on B_2, ($p<.10$). The two groups differed significantly when the relative loss in scores from B_1 to B_2 was considered, ($p<.05$, two-tailed), (Table 6). Schizophrenics showed a reduction in scores on negative stimuli compared with positive ones, while controls did not change.

Table 4

Mean Scores: People-Non-People (Consistency)

	A_{1+2}	A_3
Schizophrenic	20.1	22.1
Control	21.6	23.8

Table 5

Mean Scores: Simple Complex (Consistency)

	A_1	A_2
Schizophrenic	21.4	18.7
Control	21.4	21.8

$P < .05$

Table 6

Mean Scores: Positive-Negative Affect (Consistency)

	B_1	B_2
Schizophrenic	22.1	19.4
Control	22.9	22.1

$P < .05$

DISCUSSION

The claim that schizophrenic deficit is caused by the "human" content of task stimuli is not confirmed in the present study. In considering relative change between categories, schizophrenics showed a significantly greater loss from simple to complex stimuli than did controls, on both accuracy and consistency measures. There were no significant differences between groups in the amount of change from "non-people" to "people" stimuli. This finding suggests that the schizophrenic deficit which other studies have shown with affective stimuli can be explained in terms of complexity.

Research such as Bannister's did not take sufficient account of structural variables in task material before drawing inferences about its meaning to the subject. Others, such as Whiteman (1954), have commented on differences in complexity but concluded that the social nature of the stimuli was the more important variable. However, Whiteman did not provide an operational definition of complexity. Difficulty was defined according to the performance of the control group, and those stimuli which were most difficult for this group were assumed to be the most complex. Since this assumption was not tested Whiteman could not validly reject "complexity" as an explanation of the schizophrenic deficit he observed.

In the present study, task complexity was objectively defined, and the two groups responded differently to an increase in its level. The relative loss of consistency and accuracy from simple to complex stimuli parallels the loss which Bannister and Salmon's schizophrenic subjects showed in the transfer from "object" to "people" construing.

The "non-people" stimuli of the present study were considerably more complex than those employed by Bannister and Salmon, and were less likely therefore to be differentiated from the "people" stimuli on the dimension of complexity. In line with this the significant difference between groups occurred only when complexity was directly manipulated, irrespective of "human" content.

The nature of the schizophrenic deficit in the present study is revealed in a closer examination of the measures employed. The accuracy measure, which Bannister and Salmon (1966) found to differentiate their schizophrenic and normal groups, is not strictly a measure of thought-process disorder, and was not employed as such by Bannister and Fransella (1966) in the original Grid test. It is more a measure of thought content. Low scores reflect the idiosyncratic thinking which has been found characteristic of acute schizophrenics, (Claridge et al., 1966; Harrow, Himmelhock, et al., 1972).

In the present study it was this measure of accuracy that most clearly differentiated the two groups. The complex stimuli which reduced the accuracy of schizophrenics were those in which several characters were portrayed. Schizophrenic subjects appeared to respond to individual elements in a picture, rather than to form a general impression. Frequently, their responses appeared to have no direct relation to the stimulus picture. These types of response were qualitatively different from the responses of non-schizophrenic subjects and bear some resemblance to what Cohen, Nachmani, and Rosenberg (1974) called "perseverative chaining". They observed this in tasks which required subjects to describe sets of colours

which varied in similarity. Effective communication required the ability to edit out non-discriminating responses. Acute non-paranoid schizophrenics seemed unable to reject such sampled responses, and each successive component of a description related more to the immediately prior response than to the object being described. This type of response would lead to an adequate intensity score (agreement between responses to the same stimulus), but would reduce the accuracy score. Selective editing is less important in tasks where alternative responses are clearly differentiated, or where there are few additional cues calling for modification of an original response, as in the non-complex stimuli of the present study.

"Accuracy" makes the criterion of disorder a normative one, asking whether the person's way of viewing life is like that of other people. "Intensity" and "consistency", on the other hand, assess the amount of organization a person employs, by measuring the stability of his conceptual structure. Thus looseness of construct relationships in responding to a particular stimulus, or abrupt changes in response to the same stimulus over time, reflect disorders of the process of thought. This lack of consistent structure was apparent in the schizophrenics' responses in the present study. On complex stimuli they were more inclined to respond to different elements on different days, or to give different responses to the same element.

The other finding in the present study was the relative inconsistency of schizophrenics in their responses to stimuli with negative moods. The two groups performed similarly when

positive moods were portrayed. This suggests that the affective meaning of stimuli may well be important in schizophrenia, although its effects have been confounded with those of complexity in previous studies. A theoretical integration of the two findings must explain why a particular type of content should produce deficit.

Consideration of the literature on levels of tonic or basal arousal in schizophrenics suggests how the two results might be related. Broen and Storms (1967), in their "response interference" theory, argued that the abnormally high level of arousal in schizophrenics increased the probability of response hierarchies collapsing, given that there was an overall response strength ceiling. They argued also that this ceiling was lower in schizophrenics. Methods of controlling arousal and of coping with stressful situations vary among schizophrenic subtypes, for example, chronic patients learn to reduce cue intake in complex situations. However, Broen (1968) concluded that in situations that are relatively low stress for normals, schizophrenics with active symptoms are abnormally aroused on a number of physiological measures such as muscular tension, respiration rate, and some measures of cardiovascular functioning. He also argued that arousal-producing conditions increase the variability between alternate responses and thus lead to abnormal response interference in some schizophrenics.

If negative affect stimuli have this arousal producing capacity, then Broen and Storms' theory can explain the schizophrenic deficit which was found. There are many possible reasons for the arousal-potential of negative stimuli. Broen (1968) quoted studies showing how punishing conditions in the initial stages of a learning task increased schizophrenic deficit, which he interpreted as the effect of heightened arousal. Later in the learning sequence, punishment

decreased the strength of competing responses and improved schizophrenic performance. Both findings suit Broen and Storms' theory.

Negative affect stimuli may be construed as punishing in some way, and it is possible to impute their particular meaning for subjects to some disturbed family interaction. At the present level of interpretation, however, the important point seems to be the relationship between arousal level and response disorganization in schizophrenics. This leads to several possibilities for relating complex stimuli to those portraying negative affect. Complex stimuli may resemble negative stimuli in increasing arousal and, therefore, schizophrenic deficit. Alternatively it may be, as Broen (1968) suggested, that conditions causing high arousal may themselves increase response complexity, which in turn affects schizophrenic performance. Broen's research does not indicate the direction of causality, but what is apparent is that when both high arousal and a number of alternate responses are present, the probability of schizophrenic deficit is increased.

Suggestions for further research

The results obtained suggest the value of further testing the hypothesis concerning direction of mood. Such an investigation would examine more directly the role of arousal in a subject's response to pictures. In the present study only six moods were represented. If this number were increased results could be interpreted with greater confidence. The physiological effects of the different stimulus categories could also be measured.

A further modification is suggested because of the findings of Claridge (1967) on levels of arousal in different subtypes of

schizophrenia. He employed the sedation threshold (ST) as a measure of tonic arousal, and suggested that the length of the spiral after-effect (SAE) might relate to the strength of the arousal modulating or reactive system. He found a high ST and short SAE in schizophrenics. However he also found that paranoids were closer to neurotics than to other schizophrenics in length of SAE. The non-paranoid schizophrenics had short SAE's, and were more likely to be overinclusive and disorganized in their response on a sorting test of conceptual thinking, and showed more clinically rated thought-disorder (Claridge et al., 1966).

In the present study only non-paranoid subjects were employed. An alternative design might include a paranoid group to provide some insight into differences in conceptual organization on these tasks, related to those found by Claridge et al. The distinction has already been made between disorders of content such as delusions, and thought process disorder. The former are more likely to be reflected in low accuracy scores on these tasks. Such scores are more probable in paranoid schizophrenics, whose thinking is characteristically systematic, but is based on an initially false premise or perception. Their scores on intensity and consistency are therefore, less likely to be affected.

Selection of schizophrenic subjects has been a fundamental and recurring problem in this area of research. Reasons for not emulating Bannister's sampling procedure have already been discussed, and the consequence of this decision can now be considered. Foulds et al., (1967), suggested that the more extreme the thought-disorder of subjects, the less stable was their construing, as shown in their

intensity and consistency scores. Therefore it is reasonable to infer from the present results that if the schizophrenic group had included only those who clearly manifested thought disorder, then the differences obtained would have been greater, but have followed the same pattern. In order to test this inference a future study would restrict the experimental group to thought-disordered schizophrenics.

In comparing such groups it would also be necessary to consider intra-individual changes in amount of thought-disorder over time in schizophrenic subjects. Harrow, Tucker, et al. (1972), using the Goldstein-Scheerer Object Sorting test, showed that as schizophrenics begin to enter into clinical remission, many indices of thought-disorder diminish. This suggests that testing should be undertaken early in hospitalization. In such a study where autonomic variables would be measured, some account would need to be taken of the exact drug status of subjects. Psychoactive drugs tend to reduce tonic arousal (Ban, 1969). In line with earlier reasoning this suggests that if the schizophrenic group in the present study had not been on phenothiazines, their deficit on complex and negative stimuli might have been greater.

The composition of the stimulus pictures and the measures employed require some modification in any further study. The intensity measure of the present study was modified from that of Bannister, and this may have reduced its validity as a measure of conceptual structure. In the Bannister-Fransella test, the thought-disordered group was distinguished from others on an intensity measure which correlated responses across a relatively wide range of constructs. Intensity in the present study was measured by the extent of agreement between a subject's three

responses to a picture. The use of one word quite different from the other two, thus reduced the score considerably. This type of responding occurred frequently in all subjects. It was also possible for subjects to respond with three words each differing considerably and still obtain a high accuracy score. This meant that the mean intensity score for control subjects was so low overall, that the measure was not reliable.

To determine whether schizophrenics are less able than non-schizophrenics to organize their perceptions for this type of task, it would be necessary to increase the number of responses required for each stimulus. In this way the normal range of responses to each stimulus could be accomodated without overly affecting their hierarchical organization, and, thus, other real differences would become apparent. If six responses were required, even though one or two secondary responses seemed appropriate, the extent of agreement between those remaining would assess the level of organization.

Greater control of the positioning of characters in the stimulus pictures, e.g. the centrality of those portraying the dominant mood, is also necessary. In a study of reaction time in schizophrenics, Scherer (1972) found that chronic, non-paranoid patients narrowed their attention to central cues in a configuration when they were confronted by an increase in complexity. The deficit shown by this group was evident only when the critical stimulus was at the periphery of vision. Short term non-paranoid schizophrenics did not show the same reduction in attention under these conditions. Research previously cited suggested that increases in complexity lead to disorganization in this subtype of schizophrenic, and Scherer's

argument was that these patients learn gradually to reduce the confusion by excluding peripheral stimulation. Controlling the position of elements in a stimulus picture as well as their complexity should clarify the relationship of these variables to disorganization.

The purpose of any further study which incorporated these modifications would be to define more precisely the task conditions which increase response interference, and to assess the types of conceptual organization associated with the different subtypes of schizophrenia. Such studies have implications for both assessment and therapy. In assessing schizophrenic performance tests and measures should take account of salient cues in stimuli, so that variables such as direction of affect are controlled and do not adversely influence functioning. Describing the conditions which lead to performance decrement, and examining the nature of the performance itself, may also suggest which variables could be manipulated to modify the disturbance.

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Title of Thesis Response to stimulus complexity versus stimulus meaning in Schizophrenics

Part A

We would like brief statements that deal explicitly with each of the following points.

1. Adequacy and clarity of review of the literature.

2. Awareness of the requirements of scientific method.

3. Awareness of implication of results.

4. Contribution to knowledge and/or usefulness of results.

Additional Comments:

Signature _____

Date _____

Part B

List below any modifications which you propose to require. Please note that decisions as to the actual grade are made by the Examining Committee at the time of the oral.

No modifications proposed _____

Minor modifications proposed:
"Minor modifications may include such items as spelling or grammatical corrections, minor correction in computation, addition of explanatory note."

Major modifications proposed:
"Major modifications might include the addition of more quantitative data, correction of computations but not substance, addition of explanatory material for the purpose of clarification."

APPENDIX A

Normative responses

To establish norms the drawings were shown to ten non-hospitalized subjects, and the following method of scoring was adopted.

(i) Since subjects were asked to give responses in order of applicability, three points were given to the first response, two to the second, and one to the third. All ten protocols were scored, and this provided a list of responses to each picture.

(ii) Responses were grouped because many of them appeared to express the same idea in describing a particular drawing. The word with the highest score (from (i) above) was consulted in a thesaurus to determine what other words from the list were close in meaning to it. These formed the first group. From the remaining words the one with the highest score was consulted and any words from the list that related to it formed a second group (even if these words were already included in the first group), and so on.

(iii) The score assigned to each resulting group of words was the total of the points assigned to each word in step (i).

(iv) Groups with 20+ were given a rating of five.

" 15-19 four.

" 10-14 three.

" 6-9 two.

(v) All response groupings receiving a rating of two or more were listed with their ratings, and used by scorers for judging the accuracy of responses given in the experiment proper.

APPENDIX B

Scoring Criteria

Two raters independently assigned scores on the three measures, accuracy, intensity, and consistency, employing the following criteria.

Accuracy: A score was assigned to each of a subject's three words up to a maximum of five, if the response word conformed closely in meaning with one from the list (Appendix A, v) which had a rating of five. A word with nearly the same meaning scored four or three. If the word from the list of norms had an assigned rating of less than five, the subject's response was scored only up to that maximum, again depending on how closely it approximated the norm.

Intensity: A score of one to ten was assigned for the amount of agreement between the three words used on the first day of testing. If all three expressed almost exactly the same mood a score of ten was assigned. If two out of three expressed the same mood this was scored seven. Two points were allowed if agreement amounted to no more than the sharing of a negative or positive mood in the same general area, and this increased to seven as agreement became closer.

Consistency: A score of one to ten was assigned for the amount of agreement between a subject's three responses to a drawing on the first day, and his responses to it on the second day.

Three words on one day	similar to	three	on the other,	scored 10.
Three	"	two	"	8-9.
Two	"	two	"	7.
Three	"	one	"	6.
Two	"	one	"	5.
One	"	one	"	4.

Points were deducted as the agreement became less apparent.