# THE RELATIONSHIP BETWEEN ANXIETY AND SELF-EXPOSURE TO COMPLEXITY

By

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# THE RELATIONSHIP BETWEEN ANXIETY AND SELF-EXPOSURE TO COMPLEXITY

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TABLE OF CONTENTS

LIST OF TABLES

# CHAPTER I

## INTRODUCTION

There has been considerable recent interest in the concept of an optimal flow of incoming stimulation or information and the motivational consequences of departure from this optimum (e.g., Berlyne, 1960; Glanzer, 1958; Dember & Earl, 1957; Leuba, 1955). Berlyne (1960, p. 194), in his scholarly theoretical treatment of exploratory and related forms of behavior, has placed special emphasis on an "optimal influx of arousal potential." According to this conception organisms strive to maintain some optimal, intermediate level of exposure to arousal-producing sensory and central variables, termed "arousal potential," which may be regarded as additive and hence interchangeable in their effects on a common arousal level. Although Berlyne has set rather broad limits on what may be classed as arousal potential, he has given particularly extensive treatment to his four "collative variables": novelty, complexity, uncertainty, and conflict. Of these there is some evidence for the interchangeable nature of conflict or uncertainty (Smock, 1955a) and novelty or incongruity* (Thompson & Higgins, 1958; McReynolds & Bryan, 1956; Smock, 1955b) with other forms of arousal potential. The typical procedure in these studies has been to expose Ss to an initial situation designed to differ in the degree to which some type of arousal

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*Berlyne (1960, pp. 24-25) has classified incongruity as a variable supplementary to novelty.

potential, e.g. frustration, is presented. Ss have then been presented with a second task in which they have been allowed control of the amount of exposure to a very different form of arousal potential, such as novelty or uncertainty. Under these circumstances it has been found that Ss initially exposed to a large amount of arousal potential tend to choose lower amounts of arousal potential in the second task situation. These data have been employed by Berlyne to support his hypotheses that (a) all forms of arousal potential are interchangeable in their determination of the organism's general arousal level, and (b) that organisms seek to maintain some optimal, intermediate level of arousal potential input.

It is not clear, however, whether complexity, the most intangible of the four collative variables, may also be regarded as equivalent to other, quite dissimilar forms of arousing stimulation. This study was designed to explore the possible functional equivalence of complexity to other variables listed by Berlyne as contributing to a common pool of arousal. In common with the studies cited above, Ss presumably differing in level of arousal resulting from the action of past stimulus variables were allowed to control amount of exposure to a quite different kind of arousal potential. In contrast to the above studies, however, Ss were not exposed to an initial task designed to produce differences in arousal potential, and, further, complexity was chosen as the type of arousal potential whose degree of exposure could be controlled by S. More specifically, scores obtained with the Taylor Manifest Anxiety Scale (Taylor, 1953) were used as a measure of one kind of arousal potential, anxiety, and number of figures employed by

Ss in telling stories with the use of background cards borrowed from the Make-A-Picture-Story test (Sneidman, 1952) was taken as a measure of the degree to which Ss were willing to expose themselves to a dissimilar form of arousal potential, complexity (Brown, 1961; Berlyne, 1960, p. 38). If both stimulus complexity and anxiety, as measured by the MAS, contribute to the same common fund of arousal, and if, as Berlyne contends, organisms strive to maintain some intermediate level of arousal, then Ss possessing low MAS scores should be willing to expose themselves to greater complexity than Ss possessing high MAS scores.

# CHAPTER II

## METHOD AND PROCEDURE

### Subjects

Thirty-six Introductory Psychology students, 18 high anxious (HA) and 18 low anxious (LA), were used as Ss. The Ss, 21 female and 15 male, were selected at random from the upper 10% and lower 20% of approximately 700 students who had been administered the MAS.

### Apparatus

Sneidman's Make-A-Picture-Story test (MAPS) was used to obtain a measure of complexity. It was not the purpose of the present study to use MAPS as a projective personality test in the usual sense. The pictures and figures which by inspection would possibly arouse emotional overtone were avoided. Nine relatively neutral pictures and 13 figures were used in the present study.

### Procedure

Nine selected pictures were rated by two classes of advanced psychology students in terms of complexity and scaled by means of the paired-comparisons method (Guilford, 1954, pp. 160-168).

In addition to the Blank, three pictures were chosen for their complexity value. One was at each extreme of the scale and one was in the middle. These pictures were selected for use as backgrounds.

Ss were tested individually in a counseling room, with E unaware of Ss' anxiety level, with the following two tests:

Picture Preference Test: the nine pictures selected from the MAPS were arranged in random order and presented to the S after the following instruction: "I have some pictures here. I would like for you to rank them in terms of your preference. You may spread them out so that you can see them better."

Make-a-picture-story test: Four pictures were presented in the following order: Blank, Living-room, Doorway, and Schoolroom. E put the first picture on the stage of MAPS test to stand as a background and spread 13 figures out in front of S. The instructions followed standard MAPS procedure: "Now, all you have to do is take one or more of any of these figures, put them on the background as they might be in real life, and tell a story about the situation you have made. In telling your story, tell me who the characters are, what they are doing, etc., and how the whole thing turns out." The position of each figure placed on the background was recorded on a special recording sheet and the stories were tape recorded.

## CHAPTER III

## RESULTS

Spearman's rank correlation (Snedecor, 1956) was employed in analyzing the "picture preference test" data. The correlations between the rank order of the pictures in terms of complexity (as determined from the obtained scale values) and the median preference scores were determined for both HA and LA groups. The results are shown in Table I. The rank correlation was .87 for the HA group and .85 for the LA group (df=7). While these correlations are significant ($p < .05$) and indicate a close relationship between stimulus complexity and preference, they do not indicate any dissimilarity between the Ss' responses in the two anxiety conditions. There is therefore no difference observed between the HA and LA groups with respect to their expressed preference for certain pictures and the judged complexity of these pictures.

TABLE I

RANK CORRELATION BETWEEN GROUP MEDIAN PREFERENCE SCORES AND THE RATED COMPLEXITY OF THE PICTURES

| Anxiety level | r |
|---|---|
| HA | $.87 \pm .09$ |
| LA | $.85 \pm .10$ |

In the "make-a-picture-story" test, the degree of complexity S introduced was operationally defined by the number of figures which he placed on each background. Table II shows the mean number of

figures used by both groups of Ss on the different backgrounds.

TABLE II

MEAN NUMBER OF FIGURES USED PER BACKGROUND

| | Blank | Living-room | Doorway | Schoolroom | Totals |
|---|---|---|---|---|---|
| HA Group | 2.77 | 2.66 | 1.22 | 1.88 | 2.13 |
| LA Group | 4.39 | 2.94 | 2.16 | 3.00 | 3.12 |
| Totals | 3.58 | 2.80 | 1.69 | 2.44 | 2.62 |

A repeated measures analysis of variance was employed in analyzing the data. Analysis was made of the non-transformed raw scores, i.e., the number of figures actually utilized in the respective stories. The analysis is summarized in Table III.

TABLE III

ANALYSIS OF VARIANCE OF NUMBER OF FIGURES USED BY THE SUBJECTS

| Sources | df. | SS | MS | F | P |
|---|---|---|---|---|---|
| Anxiety | 1 | 35.00 | 35.00 | 8.10 | .01 |
| S(A) | 34 | 146.74 | 4.32 | | |
| Picture | 3 | 66.57 | 22.19 | 18.11 | .005 |
| A X P | 3 | 8.19 | 2.73 | 2.22 | .10 |
| S(A) X P | 102 | 124.99 | 1.22 | | |
| Total | 143 | 381.49 | | | |

Of most interest in this analysis is the fact that the Ss of the LA group utilized significantly more figures than did the Ss of the HA group ($p < .01$ for 1 and 34 df). As seen in Table II, the means of the LA group exceeded those of the HA group in all four pictures.

Table III also shows the variance due to pictures to be significant, .005 level, but the Anxiety X Picture interaction does not reach significance.

## CHAPTER IV

## DISCUSSION

To the extent that human preference responses are analogous to "inspective locomotor exploration" (Berlyne, 1960) in subhuman forms, the high positive correlation obtained between ranked complexity and median preference ratings is consistent with the findings of studies employing rats in exploratory situations (e.g., Brown, 1961; Dember, Earl, & Paradise, 1957; Williams & Kuchta, 1957). In these studies rats were found to spend more time in those parts of the apparatus containing more complex stimulus displays. The correlation found in the present study is also in accord with the results of a study by Berlyne (1958) in which human Ss were found to fixate the more complex figures in pairs of figures for a greater proportion of the total exposure time.

When Ss are asked to rate patterns according to preference, there is always some question as to what criteria the Ss employ in making their judgments. Berlyne (1963) found more complex figures to receive higher mean ratings than simpler figures when the figures were rated in terms of "interestingness" but less complex figures received higher mean ratings in "pleasingness." From this it would appear that the Ss in the present study were judging preferences in terms of "interestingness", since more complex patterns received higher preference ratings. It should be noted, however, that Berlyne used incongruity and irregularity in addition to number of elements to define his more complex figures. In

the present study the more complex patterns did not appear to be more incongruous or irregular than the simpler patterns.

If the results relating ranked complexity to rated preference are to be placed in the framework of Berlyne's theory of an optimal influx of arousal potential, it would appear inconsistent that no difference was found between the preference ratings of the HA and LA groups. If anxiety is held to contribute to arousal potential, it would seem that high anxious people already possess a sufficiently high level of arousal potential and, hence, would prefer patterns offering less arousal potential, i.e., the less complex patterns. However, it should be noted that the range of arousal potential presented by the patterns may not have been sufficient to differentiate between people varying widely in MAS scores. In other words, the most complex of the backgrounds may have provided insufficient arousal potential to overburden the arousal level of even the HA group. In any case this problem points up the need for more extensive studies of such variables as Berlyne's collative properties employing large ranges of stimulus values. Once it is emperically established that certain values or degrees of a given variable generally elicit maximal exploratory, orienting, or preference behavior, and, further, it is shown that both higher and lower values become decreasingly attractive, if not aversive, then it will be more profitable to introduce other variables such as manifest anxiety and investigate the effects of their interaction with these stimulus values.

As predicted on the basis of Berlyne's theory of interchangeable arousal potential, the HA group was found to employ fewer elements in the "make-a-picture-story" test. This result is in agreement with studies which have allowed Ss to choose among stimuli varying in novelty,

incongruity, uncertainty, etc., following exposure to differing amounts of stressful stimulation (e.g., Brim & Hoff, 1957; McReynolds & Bryan, 1956). In these studies it has been found that Ss exposed to prior stressful stimulation tend to behave so as to minimize exposure to additional arousal potential.

It is interesting that the "make-a-picture-story" test should have discriminated between the HA and LA groups whereas the preference ratings did not. In the preference situation an established number of stimulus arrays was presented and the Ss were confined to these. In the "make-a-picture-story" task, however, the Ss were allowed to determine the final complexity of the array. This suggests a methodological consideration in studies of preference behavior. If a set number of alternatives is used and there is little empirical evidence to work upon, it is possible to do little more than guess as the position and limits of the segment of a stimulus continuum represented by the range of alternatives. However, when S is given freedom to manipulate the stimulus values, the researcher is not confined to the limits imposed by his own choice as to what may or may not constitue an effectively diverse set of stimulus values.

Berlyne is, of course, only one of several theorists who have employed the concept of an optimal level of sensory input (Dember & Earl, 1957; Leuba, 1955). However, since Berlyne's theory has been worked out to a stage of development unique among theories of its kind, it is particularly well suited for predictive purposes. Leuba (1955) has proposed a concept of "optimal stimulation" closely resembling Berlyne's "optimal arousal potential." Additivity and interchangeability of both external

and internal stimulation are implicitly set forth. Leuba states:

> When external circumstances are only mildly stimulating, as in the case of the usual eyelid conditioning experiments, one would expect tense neurotic individuals to condition most rapidly. Under conditions of high external stimulation, however, the latter's already high level of internal stimulation might lead to an over-all state of excessive stimulation unfavorable to conditioning. In general, it might be predicted that the relaxed individual would condition best when a fairly high level of motivation and stimulation prevailed during learning; and conversely for the tense individual. (Leuba, 1955, p. 31)

Differences between the theorectical statements of Leuba and Berlyne lie largely in the more extensive development of the latter's position.

The "pacers" of Dember and Earl (1957) are also analogous to Berlyne's "optimal arousal potential." "Pacers" refer to stimuli with a complexity value "in the acceptable range" above S.'s "complexity value. Although Dember and Earl employ a definition of complexity involving subject and environmental variables, stimuli qualifying as "pacers" constitute an optimal level of sensory influx. The analysis of Dember and Earl, however, differs from that of Berlyne on at least two points of special importance to the present study. First, pacer stimuli are apparently composed only of external stimuli, and, hence, the role played by anxiety and other internal variables is not clear. Second, Dember and Earl take no precise stand on the additivity and interchangeability of stimuli in comprising pacer stimuli. Additivity and interchangeability would seem to be ruled out, since pacers are not viewed as broad pools to which any number of stimuli may contribute; rather, they are discussed at the level of single, independent attributes of single stimuli. Just how molecular this level is held to be, however, is not clear, since Dember and Earl also speak of "one's

complexity for music" and "one's complexity for literature."

Number of elements is unquestionably the simplest variable of complexity to manipulate experimentally and there is little doubt that number plays an important role both as a variable underlying locomotor exploration (e.g., Brown, 1961) and as a major determinant in the lay usage of the word "complexity" (Attneave, 1957). But it is important to stress that number may far from represent a stimulus variable basic to exploratory or preference behavior. It is probable that the importance of number to exploratory behavior will be shown eventually to rest on the relationship between number and another, possibly more basic variable, such as uncertainty. In relating number of elements in a pattern to uncertainty Berlyne states, ". . . figures with more parts can assume a greater range of alternate forms, since the parts can vary independently. . . . So complexity can be related to number of alternatives, which is one of the determinants of uncertainty." (Berlyne, 1960, pp. 40-41).

While number of elements was used as the sole index of complexity in this study, it should be indicated that the selected stimulus patterns varied along dimensions in addition to that of number. The patterns undoubtedly varied in diversity or dissimilarity, another variable suggested as basic to complexity by Berlyne (1960, p. 38-39). Central or experiential variables may also have been operating. In light of past learning, for example, a composite made up of a man, a woman, and a child may represent a lower degree of complexity or novelty than one made up of two women similar in age and a dog. The importance of central variables to exploratory and preference behavior awaits further

research and integration with the already extensive literature in such areas as motivation and personality theory.

# CHAPTER V

## SUMMARY

The purpose of the present study was to investigate Berlyne's theory that organisms strive to maintain an optimal level of arousal potential and that the variables influencing this level are additive and interchangeable.

Complexity and anxiety were used in the present study as two variables contributing to a common level of arousal. It was predicted that the degree of complexity to which Ss would be willing to expose themselves would be determined by their level of manifest anxiety, i.e., high anxious Ss would expose themselves to less complexity than low anxious Ss.

The Taylor MAS was used as a measure of anxiety and number of figures utilized by Ss in making a story with the use of background cards borrowed from Sneidman's Make-A-Picture-Story test was used as a measure of degree of complexity. Eighteen high anxious and 18 low anxious college students were individually given two successive tests: (a) a picture preference test and (b) a "make-a-picture-story" test.

The result of the first test showed significant correlations between scaled complexity and rated preference for both high anxious and low anxious groups. However, no difference was found between the correlation of the high anxious group and that of the low anxious group. This result was interpreted as due to improper control of the range of "arousal potential" represented by the pictures and the criteria

Ss employed in making their judgments.

In the second test, a significant difference was found between high anxious and low anxious groups in number of figures utilized in telling the stories. This result confirmed the hypothesis that high anxious Ss would be willing to expose themselves to less complexity, than low anxious Ss.

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# APPENDIX $A_1$

## SCALE VALUE OF NINE PICTURES USED IN PICTURE PREFERENCE TEST

| Rank | PICTURE | SCALE VALUE |
|---|---|---|
| 1. | Living Room | 3.095 |
| 2. | Street | 2.922 |
| 3. | Forest | 2.861 |
| 4. | Nursery | 2.164 |
| 5. | School-room | 1.277 |
| 6. | Closet | 1.093 |
| 7. | Stage | 1.044 |
| 8. | Doorway | 0.000 |
| 9. | Blank | ----- |

# APPENDIX $A_2$

## RAW PREFERENCE SCORE FROM

## PICTURE PREFERENCE TEST

### High Anxiety Group

| | Pictures (in order of complexity) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subjects | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 4 | 5 | 2 | 3 | 1 | 6 | 7 | 8 | 9 |
| 2 | 3 | 1 | 5 | 4 | 6 | 7 | 2 | 8 | 9 |
| 3 | 1 | 5 | 4 | 2 | 3 | 7 | 6 | 8 | 9 |
| 4 | 1 | 4 | 2 | 3 | 6 | 7 | 5 | 8 | 9 |
| 5 | 2 | 5 | 1 | 6 | 4 | 9 | 3 | 7 | 8 |
| 6 | 1 | 6 | 7 | 2 | 5 | 3 | 4 | 8 | 9 |
| 7 | 2 | 4 | 1 | 3 | 5 | 7 | 6 | 8 | 9 |
| 8 | 3 | 8 | 1 | 4 | 5 | 7 | 6 | 2 | 9 |
| 9 | 3 | 6 | 1 | 4 | 5 | 7 | 2 | 8 | 9 |
| 10 | 4 | 6 | 2 | 9 | 3 | 5 | 7 | 1 | 8 |
| 11 | 3 | 5 | 1 | 4 | 2 | 7 | 8 | 6 | 9 |
| 12 | 1 | 5 | 2 | 3 | 4 | 7 | 6 | 8 | 9 |
| 13 | 1 | 4 | 2 | 5 | 3 | 6 | 7 | 8 | 9 |
| 14 | 1 | 9 | 3 | 2 | 4 | 8 | 5 | 6 | 7 |
| 15 | 2 | 4 | 1 | 3 | 5 | 6 | 7 | 8 | 9 |
| 16 | 1 | 3 | 5 | 2 | 4 | 6 | 8 | 7 | 9 |
| 17 | 2 | 5 | 1 | 3 | 6 | 4 | 7 | 8 | 9 |
| 18 | 7 | 2 | 5 | 8 | 4 | 6 | 3 | 1 | 9 |
| Median | 2 | 5 | 2 | 3 | 4 | 7 | 6 | 8 | 9 |

# APPENDIX $A_3$

## RAW PREFERENCE SCORE FROM PICTURE PREFERENCE TEST

### Low Anxiety Group

| | Pictures (in order of complexity) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subjects | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 3 | 2 | 1 | 4 | 6 | 7 | 5 | 8 | 9 |
| 2 | 1 | 5 | 6 | 4 | 2 | 7 | 3 | 8 | 9 |
| 3 | 3 | 7 | 1 | 2 | 4 | 5 | 6 | 8 | 9 |
| 4 | 2 | 5 | 1 | 3 | 4 | 7 | 6 | 8 | 9 |
| 5 | 3 | 6 | 1 | 5 | 4 | 7 | 2 | 8 | 9 |
| 6 | 2 | 7 | 1 | 4 | 3 | 5 | 6 | 8 | 9 |
| 7 | 3 | 5 | 1 | 2 | 4 | 6 | 7 | 8 | 9 |
| 8 | 1 | 6 | 3 | 2 | 4 | 7 | 5 | 8 | 9 |
| 9 | 2 | 4 | 1 | 3 | 5 | 7 | 6 | 8 | 9 |
| 10 | 7 | 4 | 2 | 5 | 6 | 8 | 1 | 3 | 9 |
| 11 | 2 | 5 | 1 | 3 | 4 | 9 | 6 | 7 | 8 |
| 12 | 3 | 2 | 1 | 4 | 6 | 5 | 7 | 8 | 9 |
| 13 | 1 | 2 | 4 | 5 | 3 | 7 | 6 | 8 | 9 |
| 14 | 1 | 2 | 5 | 4 | 3 | 7 | 6 | 8 | 9 |
| 15 | 1 | 7 | 2 | 3 | 4 | 6 | 5 | 8 | 9 |
| 16 | 2 | 7 | 4 | 3 | 1 | 5 | 6 | 8 | 9 |
| 17 | 3 | 2 | 1 | 4 | 6 | 5 | 7 | 8 | 9 |
| 18 | 3 | 2 | 4 | 1 | 5 | 7 | 6 | 9 | 8 |
| Median | 2.5 | 5 | 1 | 3.5 | 4 | 7 | 6 | 8 | 9 |

# APPENDIX $A_4$

## NUMBER OF FIGURES EMPLOYED ON EACH BACKGROUND IN MAKE A PICTURE STORY TEST

### High Anxiety Group

| | Number of figures employed | | | | |
|---|---|---|---|---|---|
| Subjects | Blank | Living-room | Doorway | School-room | Total |
| 1 | 2 | 5 | 2 | 3 | 12 |
| 2 | 4 | 4 | 1 | 1 | 10 |
| 3 | 5 | 1 | 1 | 3 | 10 |
| 4 | 1 | 1 | 0 | 0 | 2 |
| 5 | 3 | 2 | 1 | 1 | 7 |
| 6 | 3 | 2 | 0 | 2 | 7 |
| 7 | 2 | 2 | 1 | 1 | 6 |
| 8 | 1 | 5 | 1 | 3 | 10 |
| 9 | 3 | 3 | 1 | 2 | 9 |
| 10 | 3 | 0 | 1 | 1 | 5 |
| 11 | 5 | 3 | 1 | 2 | 11 |
| 12 | 2 | 2 | 1 | 3 | 8 |
| 13 | 4 | 3 | 4 | 1 | 12 |
| 14 | 3 | 4 | 3 | 4 | 14 |
| 15 | 2 | 2 | 1 | 1 | 6 |
| 16 | 2 | 3 | 1 | 1 | 7 |
| 17 | 4 | 2 | 1 | 4 | 11 |
| 18 | 1 | 4 | 1 | 1 | 7 |
| Total | 50 | 48 | 22 | 34 | 154 |
| Mean | 2.77 | 2.66 | 1.22 | 1.88 | 2.13 |

# APPENDIX $A_5$

## NUMBER OF FIGURES EMPLOYED ON EACH BACKGROUND IN MAKE A PICTURE STORY TEST

### Low Anxiety Group

| | Number of figures employed | | | | |
|---|---|---|---|---|---|
| Subjects | Blank | Living-room | Doorway | School-room | Total |
| 1 | 5 | 2 | 3 | 3 | 13 |
| 2 | 1 | 1 | 1 | 2 | 5 |
| 3 | 5 | 2 | 3 | 4 | 14 |
| 4 | 6 | 1 | 1 | 1 | 9 |
| 5 | 6 | 4 | 1 | 3 | 14 |
| 6 | 1 | 2 | 2 | 2 | 7 |
| 7 | 5 | 3 | 1 | 2 | 11 |
| 8 | 8 | 6 | 5 | 6 | 25 |
| 9 | 2 | 1 | 1 | 4 | 8 |
| 10 | 4 | 3 | 4 | 2 | 13 |
| 11 | 5 | 3 | 2 | 3 | 13 |
| 12 | 5 | 3 | 5 | 5 | 18 |
| 13 | 3 | 3 | 1 | 2 | 9 |
| 14 | 4 | 5 | 3 | 4 | 16 |
| 15 | 2 | 1 | 1 | 1 | 5 |
| 16 | 8 | 5 | 2 | 4 | 19 |
| 17 | 5 | 4 | 2 | 2 | 13 |
| 18 | 4 | 4 | 1 | 4 | 13 |
| Total | 79 | 53 | 39 | 54 | 225 |
| Mean | 4.39 | 2.94 | 2.16 | 3.00 | 3.12 |

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