1971

An Investigation Into the Relationship between Exploratory Behavior and Affective Rating

Joseph P. Reser
Loyola University Chicago

An Investigation into the Relationship between Exploratory Behavior and Affective Rating

A thesis submitted to the faculty of the Graduate School of Loyola University in partial fullfillment of the requirements for the degree of Master of Arts.

Submitted January 10, 1971

by Joseph P. Reser

Acknowledgements

The author would like to express his gratitude to Emil J. Posavac and Homer H. Johnson for their many helpful suggestions, ready assistance, and constant patience.

Table of Contents

	Page
Abstract	iv
Introduction	1
Method	14
Results	17
Discussion	28
Appendix	33
Bibliography	34

List of Tables

Table		Page
1.	Mean correlations between looking time and liking (T. I).	18
2.	Mean correlations between looking time and liking (T. II).	18
3.	Mean correlations between looking time and good/bad rating (T. II).	19
4.	Mean correlations between liking and good/bad ratings (T. II).	19
5.	Mean correlations by sex and task order (T. I).	20
6.	Mean correlations by sex and task order (T. II).	20
7.	Mean looking time, liking rating, and good/bad rating across pictures.	21
8.	Mean correlations between looking time and liking, looking time and good/bad rating, across pictures.	22
9.	Mean correlation between looking time and liking for individual subjects.	32

List of Figures

Figure		Page
1.	Mean looking time as a function of liking. (T. I)	23
2.	Mean looking time as a function of liking. (T. II)	23

Abstract

Recent investigations into the attitudinal effects of mere exposure (Zajonc, 1968) report the surprising finding that exploratory behavior and favorable attitudes appear to be negatively related (Harrison, 1968). This finding was supportive of Zajonc's general suggestion that a response-conflict phenomenon may well be mediating his well-documented mere exposure effects. This research examines the relationship between exploratory behavior and affective rating in light of some theoretical and intuitive considerations which lead to predictions opposite those of Harrison. The empirical question which is asked is whether looking time (the generally accepted measure of exploratory behavior) reflects a positive or negative disposition towards slides of paintings in a relatively demand-free situation. A significant positive correlation was found to exist between the measures of exploratory behavior and affective rating. A critique is made of the Harrison (1968) study which reported conflicting results and upon which this study is based. Some evidence supporting specific criticisms is advanced and methodological considerations relevant to this area of research are explored.

Introduction

The empirical question to which this thesis addresses itself is the inevitable result of the convergence of two related areas of research, that concerned with curiosity and exploratory behavior (Berlyne, 1960), and that area of research concerned with the attitudinal effects of mere exposure (Zajonc, 1968). What draws these areas of investigation together is the question of whether curiosity and exploratory behavior are essentially measures of information search, or primarily measures of affect. This issue perhaps implies the more basic question of the motivational basis of exploratory behavior, a problem the resolution of which would throw considerable light on the relationship which obtains between exploratory behavior and affective rating. A brief review of these two approaches will precede the discussion of relevant theoretical and methodological concerns.

Various theoretical models of exploratory behavior have been put forward by researchers in the field. These include the variation-seeking model of Fiske and Maddi (1961), the cognitive assimilation model of Livson (1967), adaptation models (Dember and Earl, 1957), Berlyne's response-conflict model (1960), and so forth. This latter model conceptualized by Berlyne appears to be the most adequate of these various theoretical approaches and is directly related to the research

at hand. The basic premise is that specific exploratory responses are likely to result from an aversive condition due to lack of information or subjective uncertainty. This condition, termed "perceptual uncertainty", is defined as a drive aroused by a conflict-producing visual stimulus and reduced by perceptual contact with that stimulus. This conflict is seen as a simultaneous arousal of incompatible responses, the termination of which will reinforce an instrumental response. Several points might be made. Most of Berlyne's experimental work has dealt with perceptual curiosity involving visual stimuli, hence his model and research is very relevant to any studies which employ looking time as their measure of exploratory behavior. Also Berlyne postulates that this subjective uncertainty or response conflict is aversive; this, of course, implies a negative relation between exploratory behavior and affective rating.

Zajonc's research concerning the attitudinal effects of mere exposure is quite compatible with the work of Berlyne. According to Zajonc, novelty is commonly associated with uncertainty and conflict, a state more likely to produce negative than positive affect. Exploratory behavior serves a tension-reduction function, response competition decreasing as a function of exploratory behavior or repeated stimulus exposure. Thus, in contrast to the implicit premise of most approach/avoidance literature, it would appear that orienting toward a novel stimulus in preference to a familiar one may indicate

that it is less liked rather than that it is better liked. Attitudinal enhancement, then, results from the decrease in negative affect initially associated with a novel stimulus. The important distinction between Berlyne's work and that of Zajonc has to do with the notion of novelty. Zajonc is analyzing the attitudinal effects of mere exposure of novel stimuli and postulating a response-conflict mediation process. Berlyne is principally concerned with stimulus properties which induce various levels of response conflict. While novelty is one of these stimulus properties, they would also include surprise, change, ambiguity, complexity, incongruity, and so forth. Any generalizations concerning Zajonc's exposure effects must be qualified with respect to the novelty of the particular stimuli.

Theoretical and Methodological Issues

"Looking Time". Before a consideration is made of the particular study upon which this research is based, it will be necessary to consider some of the issues relative to the literature which has stemmed from research in the above areas. One important consideration has to do with the use of "looking time" as an operational definition of exploratory behavior. While this measure appears to have a good deal of consensual validity and is quite simple to implement, it remains that research in the area of curiosity and exploratory behavior in human subjects is in reality research on looking time as a function of stimulus

variables, individual differences, and environmental factors. This observation is cited as a qualification, rather than as an objection. It may, however, account for the fact that most research in this area has concentrated on those factors most likely to differentially affect the visual modality -- subsequent measures of exploratory behavior thus reflecting the influence of the stimulus factors on visual perception, as measured by the time spent looking at a particular stimulus. Any predictions made concerning the relationship between looking time and affective rating must carefully consider the nature of the stimuli used.

Stimulus Factors. A sizeable amount of research in the area of exploratory behavior has concerned itself with stimulus factors which seem to affect the duration of looking time. These stimulus variables, collectively known as collative properties, are properties such as novelty, surprisingness, complexity, and power to induce uncertainty. According to Berlyne (1964), all of them appear to involve conflict among incompatible response tendencies of one kind or another. Research has demonstrated that these properties affect other dependent variables in addition to looking time, namely, exploratory choice (Berlyne, 1963; Berlyne & Lewis, 1963; Day, 1965) and verbal evaluative ratings (Berlyne, 1963; Day, 1965, 1967). The general term which usually covers many of the stimulus properties is "complexity", which is generally defined in terms of irregularity of shape, amount of material, and heterogeneity

of elements. The general finding has been that looking time will increase as a function of stimulus complexity, although the magnitude of the effect has typically been small. At higher levels of absolute complexity, results have been somewhat equivocal (Berlyne, 1963; Berlyne & Lewis, 1963; Berlyne & Lawrence, 1964; Day, 1965).

An assessment of the relative contributions of various stimulus properties to length of looking time is complicated by the fact that these properties will tend to interact with other aspects of the experimental situation, specifically, initial exposure time and experimenter instructions. Each of these will be considered at some length. It is also the case that stimulus properties will tend to interact among themselves. A study by Reich and Moody (1970) reports a significant interaction between familiarity and complexity, which differentially affected their dependent measure of liking; subjects liked more complex familiar stimuli and less complex novel stimuli. Another possibility which must be considered in this type of research is that the nature of the stimulus may constitute a "problem" of interpretation; or, if the stimulus is meaningful, it may convey varying degrees of affect or symbolic association. The importance of these possibilities will be appreciated upon consideration of the research to be herein presented.

Experimenter Instructions. That experimenter instructions can have a dramatic influence on the amount of time the subject spends looking at a particular set of stimuli can br readily seen. If, for example, the experimenter has told the subject that there will be a subsequent test on the nature of the stimuli, the subject's looking time will tend to reflect a preoccupation with identification and recall. If the experimenter has introduced a problem-solving set, either by intention or unintentionally, the subject will preoccupy himself with finding a "solution". Consider in this respect meaningless stimuli which the subject attempts to decipher. Also, if the experimenter has explicitly told the subject that there will be no posttest, this will again undoubtedly affect his allocation of time. Evidence supporting these arguments is fairly convincing, if not considerable. One study which investigated the influence of stimulus uncertainty and experimenter instructions on visual selection (Faw, Nunnally & Astor, 1969) reports that stimulus uncertainty was an effective determinant of looking behavior only when subjects were motivated to identify the stimuli. Experiments which find that complexity is not an effective determinant of looking time report that variations in the instructions given to the subject are principally responsible for this effect (Brown & Farha, 1966; Faw & Nunnally, 1967; Day, 1968). Day (1968) asked subjects to look at stimuli under four different sets of instructions: as long as they "cared to", as long as it was interesting, as long as it was pleasing, and in light of a threatened recall test. The

results suggest that looking time increases under threat of memory tests and with vague "care to" instructions which probably induce added uncertainty in the subject. As was previously mentioned, it seems quite reasonable to suppose that the experimental instructions will interact with both the stimulus properties and initial exposure time, and possibly with the type of affective rating scale which is employed as well.

Initial Exposure Time. In addition to the experimenter instructions, the length of initial exposure of the stimulus can very significantly influence the duration of subsequent looking behavior. Consider any rather complex or ambiguous stimulus which is presented for a very short duration, perhaps a second or less. If identification or perceptual assimilation has not had sufficient time to occur, subsequent looking behavior can be expected to reflect a satisfying of uncertainty as to the nature of the stimulus. The complexity of the stimulus will dictate the amount of exposure time necessary for adequate perceptual assimilation. An insufficient exposure time may in many instances introduce a problem-solving set or unfinished-task paradigm in which the subject will use later exploratory time to resolve his initial uncertainty. A distinction made by Berlyne (1960, 1963) between "specific" and "diversive" exploration is pertinent to the above discussion. Specific exploration is seen as resulting from a lack of information or incomplete perception of a stimulus pattern which results in uncertainty and conflict. Specific exploration can be expected to continue until

perceptual curiosity has been reduced to a threshold value (via perceptual access to the stimulus). Diversive exploration, on the other hand, is seen as investigatory activity for its own sake, rather than being initiated by subjective uncertainty. It is this diversive exploration which is generally elicited by the collative properties of a stimulus. There has been some empirical support for the contention that initial exposure time will differentially affect subsequent looking behavior. Berlyne (1963) found that when initial exposure times are relatively long (3 or 4 sec.), in which case one can presume perceptual curiosity to have been largely dissipated, less complex patterns are chosen for exploration more frequently than more complex patterns. It is interesting to note that most of the recent studies in the area of exploratory behavior commonly employ exposure times of less than one second. Looking time is then measured by the number of times the subject will expose himself to the stimulus, either at the same rate of exposure, or possibly for a self-determined duration. It would appear that almost all of these studies are addressing themselves to the phenomenon of specific exploratory behavior, rather than to a larger context. This becomes especially important in the case of those studies which also report measures of affect, because in these instances the exploratory behavior will almost certainly be reflecting information search rather than affective value.

Affective Rating. An additional methodological concern which

is quite relevant to the study at hand has to do with the affective rating of the stimulus. The problem perhaps derives from a semantic confusion more than anything else; it does, however, create serious problems of interpretation. The usual procedure employed is to have the subject rate the stimulus on a semantic scale, following the exploration condition. Semantic dimensions which have been used include pleasingness, liking, preference, interestingness, good/bad, and so forth. It is not at all clear just what the relationship is between these dimensions, although it would seem fairly obvious that they are not equivalent. Day (1965) has found a positive, but low, correlation between "pleasing" and "interesting". In a later study he found that, while interest increases with complexity, ratings of pleasingness decrease (Day, 1967). Berlyne and Peckham (1966) have found that patterns considered "most interesting" or "least interesting" are rated as being "most pleasing". Other research indicates that pleasingness and interest reflect opposite response tendencies (Berlyne, 1963). As was mentioned initially, looking time can either be seen as principally a measure of information search, or primarily a measure of affect. No doubt, in real life situations, it is usually a measure of both. Addressing himself to this matter, Day (1968) presents evidence suggesting that looking time is a function of the level of collative variability rather than affect value, when the latter is measured in verbal ratings of "pleasingness". It would appear that the type of rating which the subject is asked to make predetermines,

to some extent, the motivational basis of the looking time. A recurrent error which presents itself in the literature is that positive and negative affect will be discussed in very general terms, and then measured with any of a variety of specific semantic scales. Often, too, the discussion following the research will speak of "liking" on the part of the subjects, although the rating which was made may have been in terms of "pleasingness", "interestingness", or a good/bad dimension.

Another aspect of the affective rating problem has to do with dimensions like "good/bad". If a semantic scale using a good/bad dimension is employed to measure affect in the case of meaningful stimuli, the evaluation could refer to the qualitative or aesthetic aspects of the stimulus, the moral tone, or some other type of reaction on the part of the subject. Also the scale itself might turn the experiment into a problem-solving type of situation, depending upon the type of stimuli which are used. A good/bad scale used to determine the affective rating of meaningless stimuli would be such an example. If one precept can be drawn from the above discussion, it is that one cannot use semantic scales indiscriminantly. Not only may the affective scale predetermine the motivational basis of the subject's exploratory activity, it may also constitute a "problem" which must be solved. There are also numerous studies which report that novel and complex stimuli are <u>preferred</u> to stimuli with fewer collative

properties. It remains an open question, however, as to whether the patterns subjects profess to like best, or prefer, are the ones to which they would expose themselves, in preference to others, if given the choice. Relatively few studies have included both a measure of exploratory behavior and a measure of affective rating. Those few studies which have done so report conflicting results (Berlyne & Lawrence, 1964; Day, 1966; Harrison, 1968).

Critique of Harrison Study

The study upon which the present research is based is one reported by Harrison (1968), in which a negative correlation is found to obtain between exploratory behavior and affective rating. Exposure effects and response competition are also investigated in this study, but they are not directly relevant to the present research. While some important changes have been incorporated into the present study, it was conceived as an attempt to more fully examine the relationship reported by Harrison, and to provide some supportive evidence for the criticisms which follow. Harrison's study can be criticized on the following counts:

1. The substantial negative correlation found between exploration and affective rating can possibly be accounted for by individual differences, as Harrison used different samples to measure the duration of exploratory behavior and do the actual rating (Maddi, 1968).

2. Harrison's experimental procedure was such that a problem-solving paradigm may have been established in which exploratory behavior became confounded with the resolution of a problem. The specific instances referred to are as follows. (a) The stimuli themselves were such as might well elicit a problem-solving set, i.e., nonsense words, Chinese characters, photographs of men's faces, and abstract pictures. (b) The practice stimuli consisted of abstract works of art which the subject rated as "good" or "bad". (c) Harrison used two different scales to assess affective rating in the course of the experiment proper. In the case of the nonsense words and Chinese characters the subject was asked "to guess the approximate meaning (of supposed adjectives in a foreign language) by estimating the extent to which each one represented something good or something bad". In the case of the faces, the subject was asked to indicate "how much he thought he might like or dislike each man". The above instructions, in the context of the stimuli which were used, would certainly seem prone to elicit a problem-solving type of response.

3. The affective rating scale which Harrison used for part of his study (i.e., the good/bad dimension) may have little or no relation to the "liking" to which he refers in his article. If affective rating is to be equated with liking, the rating scale should be specifically worded in such a way as to insure that the subject's liking is assessed, and not the relative merits or meaning of the stimuli.

Additional Considerations. Two additional considerations raise doubts as to the external validity of Harrison's findings. (a) There is some experimental data which appears to be in conflict with the results reported by Harrison. A study by Day (1966) reportsthat 27 of the 30 subjects participating in the experiment spent more time looking at all the figures they rated as "liked" than they did on those rated "not liked". Also if one considers the large amount of literature which reports that novel and complex stimuli are preferred to stimuli with fewer collative properties, this would appear to be a strong counter-argument to Harrison's response- conflict explanation of his results. (b) The second consideration is based on intuition rather than empirical evidence. It would appear that in a natural situation, time spent looking at an object may very well reflect a positive response such as preference or liking. It is felt that this situation would predominate in an aesthetic and relaxed setting such as a gallery or art museum, etc.. Harrison himself proposes that his observed relationship may have limits to its generalizeability.

Hypotheses

The hypotheses which culminated in the present study were essentially two. (a) In some situations there will exist a positive correlation between exploratory behavior and liking. (b) The experimenter instructions used in the Harrison study may have altered the relationship between liking and looking time in the direction of Harrison's hypothesis. While an

attempt was made to follow Harrison's general procedure, the present study differs in several important respects. The stimuli which were used were slides of paintings, rather than the stimuli employed by Harrison, namely, photographs of faces, Chinese characters, and nonsense words. A second difference was that the same sample was used both to rate the stimuli and explore them. The final important departure from Harrison's procedure was the use of two treatment groups, one of which received somewhat different instructions and a different rating scale from what was used in the Harrison study.

Method

Subjects

Subjects were 64 undergraduate students enrolled in the introductory psychology courses offered at Loyola University. They were randomly assigned to two experimental conditions, with the restriction of an equal number of males and females within each group. Each treatment group was again divided in order to balance the order of visual exploration and liking ratings.

Stimulus Materials

The stimulus materials consisted of twenty slides of paintings, chosen both for their representational character and their relative unfamiliarity (see appendix). Slides were randomly ordered with each presentation so as to obviate any ordering effects. They were projected onto a screen at

a distance of ten feet from projector and subject by a Kodak Carousel Projector. Timing was done manually with the aid of a stopwatch and a tachistoscope shutter. Subjects switched slides with a remote control switch.

Procedure

The procedure for each of the treatment groups was somewhat different. In the first treatment group each subject was told that he was going to participate in a mood-inducing experiment concerned with aesthetic enjoyment and relaxation. He was then told that he would be shown a series of slides of paintings and that he might examine these at will, moving forwards or backwards in the series, and looking at each painting for as long or as many times as he wished. The subject was also told that he would not be tested on the material which he would review. Each subject in this treatment group was then shown the series of twenty slides, each slide being presented for a duration of three seconds. One half of the subjects were at this time instructed in the use of the projector and allowed to examine the slides, times being recorded as unobtrusively as possible. After these subjects explored the slides for as long as they wished, they were asked to rate the extent to which they liked or disliked each painting. Three practice slides which the subject had not yet seen were used at this time to insure that the subject completely understood the rating procedure which was employed. The twenty slides were then again presented to the subject for a duration of

three seconds each, with sufficient time inbetween for the subject to record his affective rating. The remaining half of the subjects in this first treatment group were asked to rate the paintings immediately after the initial presentation, three sample slides again being used. Following the rating, they were instructed in the operation of the projector and allowed to explore the slides. The reversal of task order was merely to balance any order effects which might possibly obtain.

The procedure for the second treatment group differed from that of the first treatment group, both in the instructions given to the subject, and in the addition of a "good/bad" semantic scale. These modifications allowed the experimenter to more closely approximate the procedure used by Harrison. Each subject was told that he would be presented with a series of slides of paintings and that he should merely watch as the experimenter quickly presented them to him. Following this initial presentation (each slide being shown for a duration of three seconds), one half of the subjects were instructed in the operation of the projector and asked to examine all slides carefully. After they had done this to their satisfaction, they were presented with three sample slides which they had not yet seen, and asked to rate the extent to which they thought each sample painting was either "good" or "bad". Following the presentation of the sample slides, the subjects were told that they would again be shown the slides which they had previosly viewed, and that they were to (a) guess the

approximate meaning or mood of each painting by estimating the extent to which each one represented something good or something bad, and (b) rate the extent to which they liked or disliked each painting. Each of the slides was again presented for a duration of three seconds for this purpose, and the subjects made ratings on two separate sheets, each of which contained one of the semantic scales. The remaining half of the subjects in this treatment group were asked to do the rating immediately following the initial presentation of the slides, and, after they had finished with this, they were asked to examine all slides carefully. All of the instructions used in this second treatment group closely paralleled those used by Harrison. The rating scales which were used were standard seven-point semantic scales.

Results

Mean Correlations between Liking and Looking Time

The mean correlation between liking and looking time for the first treatment group was +.565 ($p < .001$; see Table 1). The mean correlation between these two variables for the second treatment group was +.261 ($p < .001$; see Table 2). As predicted, the experiment provided a situation in which a positive relationship obtained between looking time and liking, and there was a significant difference between the mean correlations for the two treatment groups ($p < .001$). These mean correlations between liking and looking time were computed across subjects,

TABLE 1

Mean Correlations between Liking and Looking Time: Treatment I

Subjects	Sex	Condition	Correlation
1-8	Male	view-rate	+.446***
9-16	Female	view-rate	+.572***
17-24	Male	rate-view	+.588***
25-32	Female	rate-view	+.654***
1-32	Both	Both	+.565***

Note.--*df* = 158 for subgroup *rs*; *df* = 638 for treatment *r*.
*** $p < .001$.

TABLE 2

Mean Correlations between Liking and Looking Time: Treatment II

Subjects	Sex	Condition	Correlation
33-40	Male	view-rate	+.054 n.s.
41-48	Female	view-rate	+.218**
49-56	Male	rate-view	+.364***
57-64	Female	rate-view	+.405***
33-64	Both	Both	+.261***

Note.--*df* = 158 for subgroup *rs*; *df* = 638 for treatment *r*.
** $p < .01$.
*** $p < .001$.

TABLE 3

Mean Correlations between Looking Time and Good/Bad Rating: Treatment II

Subjects	Sex	Condition	Correlation
33-40	Male	view-rate	-.186*
41-48	Female	view-rate	-.072 n.s.
49-56	Male	rate-view	+.139 n.s.
57-64	Female	rate-view	+.120 n.s.
33-64	Both	Both	+.004 n.s.

Note.--*df* = 158 for subgroup *rs*; *df* = 638 for treatment *r*.
* $p < .05$.

TABLE 4

Mean Correlations between Liking and Good/Bad Rating: Treatment II

Subjects	Sex	Condition	Correlation
33-40	Male	view-rate	+.206**
41-48	Female	view-rate	+.322***
49-56	Male	rate-view	+.492***
57-64	Female	rate-view	+.309***
33-64	Both	Both	+.333***

Note.--*df* = 158 for subgroup *rs*; *df* = 638 for treatment *r*.
** $p < .01$.
*** $p < .001$.

TABLE 5

Mean Correlations between Liking and Looking Time -- by Task Order and Sex; Treatment I

Sex/Task Order	Mean Correlation
Males	+.517***
Females	+.613***
View-Rate	+.509***
Rate-View	+.621***
Combined	+.565***

Note.--df = 318 for subgroup rs; df = 638 for treatment r.

*** $p < .001$.

TABLE 6

Mean Correlations between Liking and Looking Time -- by Task Order and Sex: Treatment II

Males	+.210***
Females	+.312***
View-Rate	+.136**
Rate-View	+.385***
Combined	+.261***
Sex/Task Order	Mean Correlation

Note.--df = 318 for subgroup rs; df = 638 for treatment r.

** $p < .01$.

*** $p < .001$.

TABLE 7

Mean Looking Time, Liking Rating, and Good/Bad Rating across Pictures: Treatments I & II.

Picture	Mean Looking Time T-I	Mean Liking Rating T-I	Mean Looking Time T-II	Mean Liking Rating T-II	Mean Good/ Bad Rating T-II
1	21.8	5.0	8.4	4.8	5.9
2	17.5	4.1	10.4	5.1	4.6
3	12.8	3.8	8.0	3.7	4.6
4	14.2	4.3	9.8	4.5	5.4
5	20.1	5.0	9.5	5.4	6.1
6	12.4	3.8	8.2	3.0	1.8
7	7.5	4.0	7.0	4.4	5.1
8	31.0	6.1	15.4	6.2	4.9
9	29.2	5.7	11.8	6.2	6.4
10	18.2	4.9	10.1	3.7	1.8
11	16.9	4.8	9.7	5.2	4.2
12	12.0	3.4	7.2	3.4	3.8
13	7.9	3.2	9.7	3.4	4.6
14	16.6	3.5	10.1	3.9	3.7
15	22.5	5.5	12.6	4.8	3.0
16	13.8	4.3	10.9	4.4	3.5
17	13.0	4.2	12.3	4.0	2.6
18	17.3	5.2	12.4	5.3	2.6
19	11.6	4.3	8.8	4.1	2.4
20	12.1	3.9	9.4	3.3	2.2

TABLE 8

Mean Correlations between Liking and Looking Time, and Good/Bad Rating and Looking Time (across Pictures)

Pictures	Liking x Looking Time: Treatment I	Liking x Looking Time: Treatment II	Good/Bad Rating x Looking Time: Treatment II
1	+.254	+.050	-.125
2	+.409**	+.139	-.124
3	+.434**	+.181	+.342*
4	+.507***	+.261	+.264
5	+.242	-.115	+.040
6	+.360*	+.264	+.386*
7	-.086	-.090	+.246
8	-.409**	+.001	-.245
9	+.220	+.121	-.124
10	+.328*	+.177	+.070
11	-.093	-.132	-.288
12	+.102	-.055	+.165
13	+.320*	-.179	+.145
14	+.450**	-.130	+.551***
15	+.061	+.040	+.097
16	+.395*	-.169	+.082
17	+.300*	+.001	+.181
18	+.200	-.132	-.124
19	+.202	+.207	-.238
20	-.008	-.008	+.139
All	+.209***	+.022	+.072

Note.--*df* = 30 for *rs* by picture; *df* = 638 for overall *rs*.
* $p < .05$
** $p < .01$
*** $p < .001$

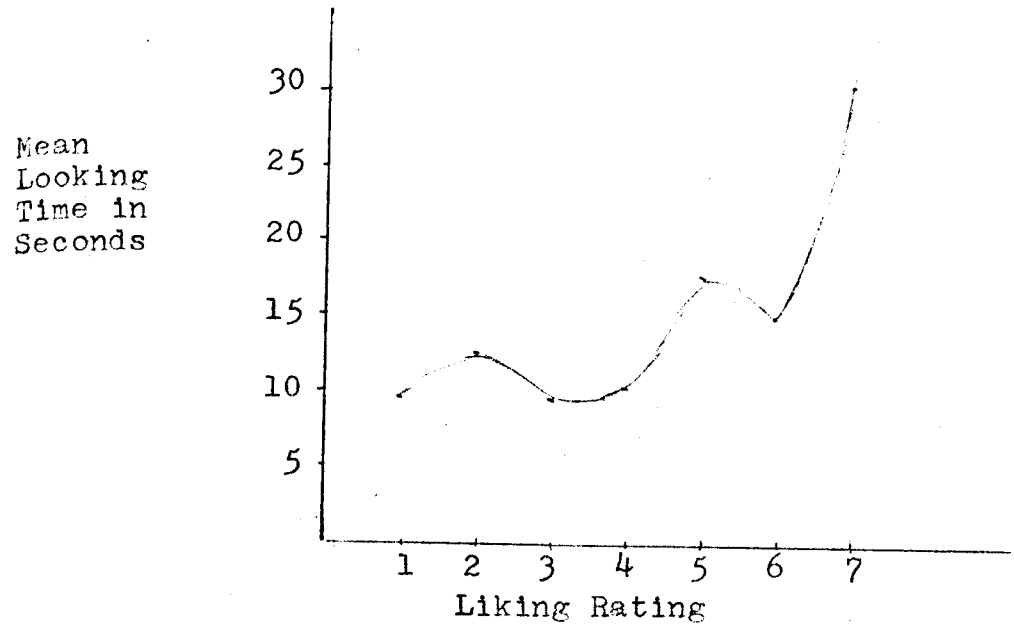

Fig. 1. Mean looking time as a function of liking: treatment I.

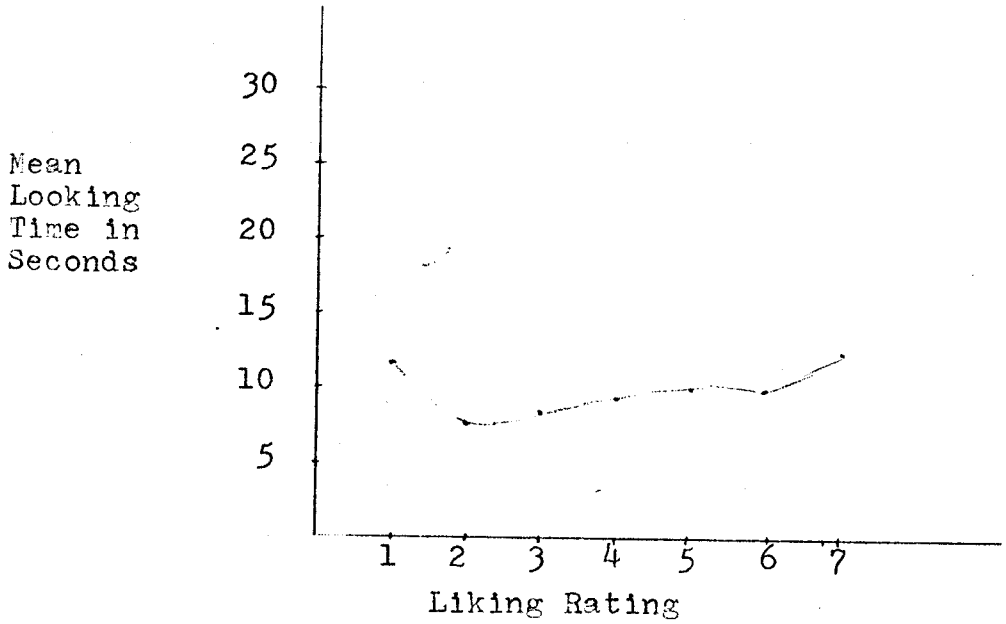

Fig. 2. Mean looking time as a function of liking: treatment II.

each subject's correlation coefficient representing the relationship between liking and looking time over twenty pictures. It is also possible to compute the correlations across pictures; this is the procedure followed by Harrison. In this case the mean correlation between liking and looking time is computed for each picture, and then averaged for the treatment group as a whole. When this procedure is adopted, the mean correlation between looking time and liking for the first treatment group becomes +.209 ($p < .001$; see Table 8). The mean correlation for the second treatment group becomes +.022, which is nonsignificant. Obviously the two methods of calculation produce quite different mean correlations.

The problem inherent to the second method of calculating the mean correlation (across stimuli) is that individual differences appear to be overlooked, thus attenuating the relationship which holds between the two dependent measures. In the Harrison study this procedure was unavoidable, as he used different samples to measure the two dependent variables of exploratory behavior and affective rating; his results, however, become somewhat questionable in the light of possible individual differences in sample populations. The data from the present study would seem to indicate that there are very dramatic differences between individuals as regards each one's typical investigatory response (see Table 9). A correlation coefficient which disregards this individual consistency of behavior will not adequately reflect the true extent of the relationship which obtains between the relevant dependent

measures. While this argument does not bear directly on the Harrison study, for reasons mentioned, it remains quite valid, and can be cited as relevant to much of the research in the area of exploratory behavior and affective measures. The wide range of individual variations in the data reported in this study lends considerable credence to the above argument, as does the appreciable difference between the two methods of computing mean correlations.

Mean Correlation between Looking Time and "Good/Bad" Rating

The second treatment group also rated the twenty stimuli on an additional "good/bad" semantic scale, this being the rating procedure employed by Harrison. The mean correlation between looking time and the good/bad rating, computed across pictures, was +.072 (n.s.; see Table 8). A strict comparison of the present study with Harrison's data necessitates using the mean correlation between looking time and the good/bad rating as this was the affective scale employed by Harrison. The Harrison study reported a mean correlation of -.44 ($p < .005$) between looking time and affective rating. The correlation found by the present research is significantly different, as reported above, $r = +.072$. The value of this comparison is, of course, quite limited. The stimuli used in the present study differ radically from those employed by Harrison, and there were undoubtedly minor differences between the experimental situation encountered by Harrison's subjects and that obtaining for the second treatment group of the current study.

Also Harrison used different samples for his exploration and affective rating conditions.

Mean Correlation between "Liking" and "Good/Bad" Rating

The correlation between the liking rating and the good/bad rating for the second treatment group was computed and found to be quite low, $r = +.333$ (see Table 4), thus supporting the contention that the two scales are not at all equivalent. This, of course, makes any general comparisons between Harrison's reported "liking" and the liking ratings reported in the present research quite tenuous. It is quite valid, however, to compare the mean correlation between liking and looking time for the first treatment group with that for the second treatment group. Any differences which obtain here can reasonably be attributed to the differences in the experimental instructions between the two treatment groups. As was stated previously, the differences between the mean correlations for the two treatment groups was quite significant ($p < .001$; see Tables 1 and 2). One can thus say that Harrison's instructions, which were the same as those used in the second treatment group of the present study, were undoubtedly partially responsible for his obtained results.

Mean Correlations Based on Sex and Task Order

Separate mean correlations between looking time and liking were also computed on the basis of sex and task order. The mean correlation between looking time and liking for

female subjects was found to be consistently and appreciably higher than that for males in both treatment groups, although these differences did not achieve significance (see Tables 5 and 6). Interestingly enough, this sex difference did not hold up for the mean correlation between looking time and the good/bad ratings in the second treatment group. Significant task order differences were found between subgroups in both treatments of the experiment. Those subjects that were in the rate-then-view conditions maintained a consistently and significantly higher correlation between looking time and liking than those who initially viewed the stimuli, then rated them ($p < .05$). This difference is particularly noteworthy if one looks at the same-sex subgroups in each treatment group (see Tables 1 and 2). A significant difference in mean correlations ($p < .01$) due to order of tasks also holds for the correlation between looking time and the good/bad rating in the second treatment group. In this case the mean correlations for the male and female view-then-rate subgroups are both negative, while those for the subjects in the rate-then-view subgroups are positive (see Table 3).

Additional Observations

An analysis of the data across stimuli provides some interesting findings. Subjects appeared to spend more time on those paintings which they either rated as liking very much or disliking a great deal (see Figures 1 and 2). This resulted in a somewhat curvilinear relationship between looking time

and liking which undoubtedly depressed, to some extent, the overall positive correlation between looking time and liking. It also appeared that certain paintings more than others were responsible for this effect (see Table 7). It seems that a stimulus which elicits a strong reaction, whether it be positive or negative, will eventuate in a longer looking time. There is also some evidence that the particular relationship between looking time and liking will reflect individual response styles. The performance of 6 of the 64 subjects in the experiment reflected a moderately strong negative correlation between looking time and liking (see Table 9).

Discussion

The study has demonstrated fairly convincingly that there are important limitations to the negative relationship between exploratory behavior and liking reported by Harrison. It also offers some support for those criticisms directed toward his experimental procedure. The results do not, however, say very much about the response-conflict model of exploratory behavior, with its associated negative affect. It would appear that those experiments which use stimuli conducive to uncertainty and response conflict do demonstrate an aversive affective reaction, as well as a negative relationship between exploratory behavior and liking; those studies which use rather straightforward stimuli do not seem to encounter these effects (Day, 1966). Despite these limitations, one may safely conclude that there are situations in which investigatory or looking behavior

will indicate preference or liking.

Some interesting questions present themselves regarding the differences between mean correlation due to sex of subject and task order. There have been some studies which have demonstrated significant sex differences due to stimulus complexity (Reich & Moody, 1970), but there does not appear to be an adequate explanation for these or the present results. Similarly, there is no apparent explanation for the effects of task order which were found. It is conceivable that the subjects in the rate-then-view conditions achieved a higher mean correlation between liking and looking time because they had previously "committed" themselves to liking particular paintings, but this explanation seems a little weak. Posttest interviews indicated that many of the subjects in these rate-then-view conditions would have changed their ratings after the exploration portion of the experiment. Just what this indicates is unclear.

The stimuli used in the present study, while they perhaps contribute to a more real life situation, also bring with them a host of other concerns. Some of these attendant difficulties stem from the "meaningfulness" of the stimuli. Relatively few studies have investigated this aspect of the stimulus (Munsinger & Kessen, 1964; Reich & Moody, 1970), but such a consideration would have to include the symbolic content of the stimuli, their aesthetic merits, their representational versus abstract qualities, and their associational impact on

on individual subjects. Any or all of these factors might very readily affect the subject's behavioral response to the stimuli. Also these factors no doubt inflate the individual differences found in the reported data. While it is fairly easy to rate random or meaningless stimuli on various dimensions dimensions of complexity, it is another matter to introduce these ratings with paintings or other meaningful stimuli. The scarcity of adequate dimensions and the lack of understanding, however, in no way mitigate the value of these more realistic stimuli.

One must also carefully consider the question of looking time as a dependent measure in the case of stimuli such as paintings. The looking time may indicate any of many possible reactions, whether they are liking, fascination, "curiosity", horror, or distaste. The present data indicates that many people will spend a considerable length of time both on those pictures which they like a great deal, and on those which they like very little. Certain paintings especially seemed to elicit this type of behavior. A superficial examination of the paintings used in the study (Appendix) seemed to indicate that those paintings disproportionately responsible for extreme ratings and lengthy looking times were relatively higher in symbolic content than the other paintings, and were either very tranquil or quite emotionally charged. Because of these multiple uncontrolled stimulus variables, results have to be qualified as to their generalizeability, yet the data indicates many interesting avenues of investigation.

In summary it might be said that the study accomplished its intended purpose. The initial hypotheses were supported and methodological arguments were advanced which appear to be quite relevant to research in the area which was covered. The criticism of the Harrison study would have been more convincing had the same test stimuli been used, however interest was more directly concerned with the influence paintings might have in this area of research. If nothing else has been accomplished, the study hopefully underscores the complexity of the relationship between exploratory behavior and affective rating.

TABLE 9

Mean Correlation between Liking and Looking Time for Individual Subjects: Treatments I and II.

Subject	Correlation	Subject	Correlation
1	+.461	33	-.471
2	-.749	34	-.297
3	+.805	35	+.399
4	+.793	36	+.148
5	+.724	37	+.345
6	+.817	38	-.332
7	+.336	39	+.412
8	+.394	40	+.232
9	+.857	41	+.301
10	+.224	42	+.134
11	+.306	43	+.415
12	+.672	44	-.074
13	+.732	45	+.388
14	+.910	46	-.311
15	+.393	47	+.489
16	+.490	48	+.402
17	+.776	49	+.657
18	+.730	50	+.826
19	+.722	51	+.532
20	+.448	52	-.332
21	-.073	53	+.345
22	+.693	54	+.450
23	+.736	55	-.136
24	+.659	56	+.575
25	+.245	57	+.590
26	+.690	58	+.216
27	+.824	59	+.635
28	+.775	60	+.514
29	+.646	61	+.380
30	+.882	62	+.402
31	+.422	63	+.235
32	+.739	64	+.271

Note.—Each correlation is based on a sample of 20 stimuli.

Appendix

Listing of Paintings:

1. JMW Turner -- Bligh Sand
2. Gericault -- La folle
3. Daniell -- The Favorite of the Harem
4. Kersting -- Caspar David Friedrich in His Studio
5. JMW Turner -- Chichester Channel
6. Scott -- Russians Burying Their Dead
7. Delacroix -- Woman with a Parrot
8. Martin -- Sadak in Search of the Waters of Oblivion
9. Danby -- Blaise Castle Woods
10. Fuseli -- Lady Macbeth Siezing the Daggers
11. Gericault -- Portrait of Eugene Delacroix
12. Daumier -- Ratapoil (Sculpture in Bronze)
13. Jan Mostaert -- Portrait of a Young Man
14. Bonington -- Quentin Durward at Leige
15. Friedrich -- The Wreck of the "Hope"
16. Gericault -- Two Heads
17. Boissard -- The Retreat from Russia
18. Friedrich -- Abbey under Oak Trees
19. Goya -- Interior of a Prison
20. Millet -- Quarrymen

Bibliography

Attneave, F. Physical determinants of the judged complexity of shapes. Journal of Experimental Psychology, 1957, 53, 221-227.

Barron, F. & Welsch, G.S. Perception as a possible factor in personality style: its measurement by a figure preference test. Journal of Psychology, 1952, 33, 199-207.

Berlyne, D.E. The influence of complexity and novelty in visual figures and orienting responses. Journal of Experimental Psychology, 1958, 55, 289-296. (a)

Berlyne, D.E. Supplementary report: complexity and orienting responses with longer exposures. Journal of Experimental Psychology, 1958, 56, 183. (b)

Berlyne, D.E. Conflict, arousal, and curiosity. Toronto: McGraw-Hill, 1960.

Berlyne, D.E. Curiosity and exploration. Science, 1966 153, 22-33.

Berlyne, D.E. & Lawrence, G.H. Effects of complexity and incongruity variables on GSR, investigatory behaviors, and verbally expressed preference. Journal of General Psychology, 1964, 71, 21-45.

Berlyne, D.E. & Lewis, J.L. Effects of heightened arousal on human exploratory behavior. Canadian Journal of Psychology, 1963, 17, 398-411.

Brown, L.T. & Farha, W. Some physical determinants of looking time under three instructional sets. Perception and Psychophysics, 1966, 1, 2-4.

Bullock, D.H. Note on "looking at pictures" behavior. Perceptual and Motor Skills, 1959, 9, 333.

Day, H. Exploratory behavior as a function of individual differences and level of arousal. Unpublished Ph.D. thesis, University of Toronto, 1965.

Day, H. Looking time as a function of stimulus variables and individual differences. Perceptual and Motor Skills, 1966, 22, 423-428.

Day, H. Evaluation of subjective complexity, pleasingness, and interestingness for a series of random polygons varying in complexity. Perception and Psychophysics, 1967, 7, 281.

Day, H. Some determinants of looking time under different instructional sets. Perception and Psychophysics, 1968, 5, 279-281.

Dember, W.N. & Earl, R.W. Analysis of exploratory, manipulatory, and curiosity behavior. Psychological Review, 1957, 64, 91-96.

Faw, T.T. & Nunnally, J.C. The effects on eye movements of complexity, novelty, and affective tone. Perception and Psychophysics, 1967, 7, 263-267.

Faw, T.T., Nunnally, J.C., & Astor, N.A. The influence of stimulus uncertainty and experimental instructions on visual selection. Perception and Psychophysics, 1969, 6, 137.

Fiske, D.W. & Maddi, S.R. Functions of Varied Experience. Homewood, Ill: Dorsey, 1961.

Garner, W.R. & Clement, D.E. Goodness of pattern and pattern uncertainty. Journal of Verbal Learning and Verbal Behavior, 1961, 17, 446-452.

Greenberger, E., Woldman, J., & Yourshaw, S.W. Components of curiosity: Berlyne reconsidered. British Journal of Psychology, 1967, 58, 375-386.

Harrison, A.A. Response competition, frequency, exploratory behavior, and liking. Journal of Personality and Social Psychology, 1968, 9, 363-368.

Leckart, B.T. Looking time: the effects of stimulus complexity and familiarity. Perception and Psychophysics, 1966, 1, 142-144.

Leckart, B.T. & Bakan, P. Complexity judgements of photographs and looking time. Perceptual and Motor Skills, 1965, 21, 16-18.

Leckart, B.T. & Faw, T.T. Looking time: a bibliography. Perceptual and Motor Skills, 1968, 27, 91-95.

Leckart, B.T., Keeling, K.R., & Bakan, P. The effect of rate of presentation on free looking time. Perception and Psychophysics, 1966, 1, 107-109.

Livson, N. Towards a differentiated construct of curiosity. Journal of Genetic Psychology, 1967, 11, 73-84.

Maddi, S.R. Meaning, novelty, and affect: comments on Zajonc's paper. Journal of Personality and Social Psychology: Monograph Supplement, 9, 28-29.

Maddi, S.R. & Andrews, S.L. The need for variety in fantasy and self-description. Journal of Personality, 1966, 34, 610-625.

McReynolds, P. Exploratory behavior: a theoretical interpretation. Psychological Reports, 1962, 11, 311-318.

Munsinger, H. & Kessen, W. Uncertainty, structure, and preference. Psychological Monographs, 1964, 78, (Whole No. 586).

Murray, S.K. & Brown, L.T. Human exploratory behavior in a "natural" versus a laboratory setting. Perception and Psychophysics, 1967, 2, 230-232.

Osborne, J.W. & Farley, F.H. The relationship between aesthetic preference and visual complexity in abstract art. Psychonomic Science, 1970, 19, 69-70.

Reich, J.W. & Moody, C.A. Stimulus properties, frequency of exposure, and affective responding. Perceptual and Motor Skills, 1970, 90, 27-35.

Wohlwill, J.F. Amount of stimulus exploration and preference as differential functions of stimulus complexity. Perception and Psychophysics, 1968, 4, 307-312.

Zajonc, R.B. Attitudinal effects of mere exposure. Journal of Personality and Social Psychology: Monograph Supplement, 1968, 9, 1-27.

APPROVAL SHEET

The Thesis submitted by Joseph Reser has been read and approved by members of the Department of Psychology.

The final copies have been examined by the director of the Thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the Thesis is now given final approval with reference to content and form.

The Thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts.

January 15, 1971
Date

Signature of Advisor