Conceptual complexity and internal arousal

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The relation between internal arousal and information processing was used to test Schroder et al's theory of conceptual complexity. Twenty complex and 20 simple Ss viewed stimuli varying in complexity while GSR was monitored. Main effects for both stimulus complexity and conceptual complexity were significant, supporting the theory. A differential habituation hypothesis was rejected. Implications for the theory were discussed.

The theory of conceptual complexity developed by Schroder, Driver, & Streufert (1967) concerns itself with the manner in which information is processed and organized by the individual. Extensive support has been given to the postulates concerning the effects of information load on conceptual structuring (Driver, 1962) and on decision-making (e.g., Streufert, Suedfeld, & Driver, 1965; Streufert & Driver, 1965), demonstrating an inverted U-shaped function relating complex cognitive functioning and environmental stress (including information load).

Schroder et al (1967) have also suggested that simple and complex individuals differ in terms of the characteristic level of internal processing and integrating of information. Simple individuals anchor behavior in external conditions, with a corresponding restriction of internal process, while more complex individuals generate many different interactions from the same external situation, implying a more internal process. These characterizations suggest that the more complex person would process more information from a given input than would a person with a simpler conceptual structure.

A substantial body of experimentation argues for the correlation of information processing and internal arousal. Berlyne (1961) has shown that the magnitude of one measure of arousal, the galvanic skin response (GSR), increases with the level of information presented to the S, measured in terms of stimulus complexity. Other studies have shown that specific "collative" variables (e.g., complexity, incongruity, novelty, and surpringness) affect the magnitude and incidence of the GSR (Berlyne, Craw, Salapatek, & Lewis, 1963) and other measures of arousal such as EEG alpha blocking (Berlyne, 1960). Such a relationship allows the investigation not only of stimulus differences, but also of individual differences in the level of information received, as indicated by internal arousal. If the proposal of Schroder et al (1967) is correct, it would be expected that the more complex individual would show a higher degree of arousal, as measured by the GSR, than would his simpler counterpart when exposed to the same level of external information, as the level of information he receives from any single stimulus will be greater due to his more exhaustive information search.

SUBJECTS

Subjects were 40 male college juniors and seniors, selected from an original pool of 117 students on the basis of scores on the Impression Formation Test (IFT) (Schroder, Driver, & Streufert, 1967; Streufert & Driver, 1967) as being the 20 most complex and 20 most simple in conceptual structure.

APPARATUS

Two sets of five randomly generated polygons (see Fig. 1) previously scaled in terms of complexity (Owen, 1964) were selected to form two approximately equivalent sets. These stimuli were printed on 4 x 5 in. paper for display through a 3 x 4 in. window in a display board. The display board measured 18 x 30 in. with the two windows located 6 in. apart, 5 in. from the base. Ss opened doors over these windows in order to view the stimuli.

A six-channel, Model 601TP recorder from Lafayette Instrument Company was used to measure GSR on tape moving at 3 in./min. Electrodes were attached to the second and fourth toes on the S's right foot in order to allow free arm movement. The foot on which electrodes were placed was set into an inclined frame in order to minimize false recording from toe movement or pressure. Electrodes were attached with the use of electrode paste to insure contact.

METHOD

As S entered the room E explained the equipment to him in order to alleviate any anxiety, without revealing the nature of the experiment. S was seated so that he could not see the GSR recorder, and the electrodes were attached. During the next 5 min S was introduced to the equipment and the tasks were explained to him. During this period S was balanced on the recording equipment according to a sensitivity/resistance curve which standardized deflections in ohms/millimeter. Following this period S began self-exposure to the stimuli in Set A, presented individually in random order by E. S was then presented with all possible pairs of stimuli from Set B, one behind each display door. When E said, "Ready," S opened a door and looked at that stimulus for as long as he wished, then closed that door and opened the other. After closing the doors E replaced that pair of stimuli with the next. Length of observation was recorded by an electric clock actuated by opening the doors.

RESULTS

Internal arousal, as measured by GSR deflection, was compared by analysis of variance in Task A, using a 2 by 5 repeated measures design (Winer, 1962). The main effect of conceptual complexity was significant [$F(1,38) = 8.5$, $p < .01$], as was the main effect for stimulus complexity [$F(4,152) = 11.72$, $p < .01$]. The interaction term did not achieve significance. As may be seen in Fig. 2, this analysis demonstrates that conceptually complex individuals tend to exhibit greater arousal viewing each stimulus, and that the level of arousal for both groups increases with the complexity of the stimulus.

Task B did not allow comparable analysis of variance techniques, but did allow comparison of mean level of arousal exhibited by each of the groups across all stimulus combinations. The difference between groups was significant by t test

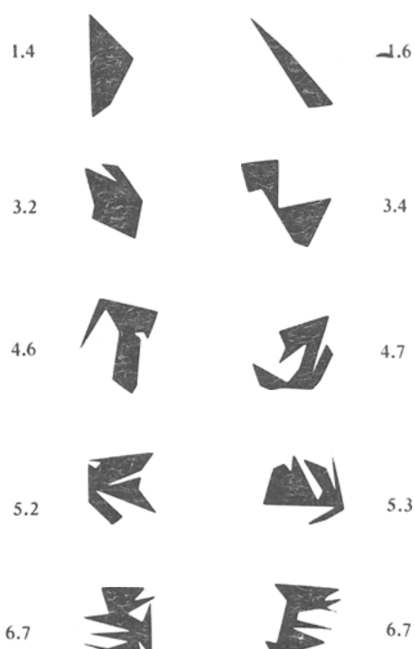

Fig. 1. Complexity ratings and stimuli used in Tasks A and B.

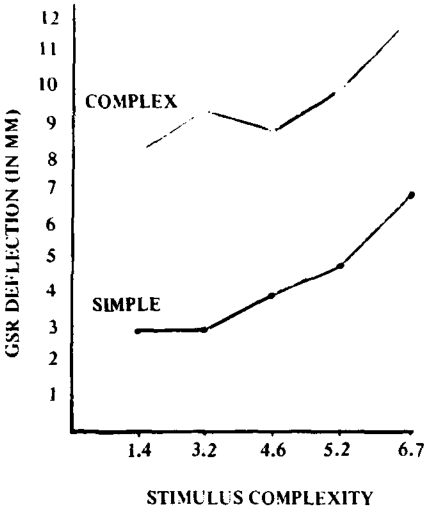

Fig. 2. Effects of conceptual and stimulus complexity on GSR.

($t = 5.47$, $p < .001$),[1] with the complex Ss having a mean deflection of 7.81 mm (SD = 7.0 mm); for simple Ss, mean = 3.38 mm (SD = 4.3 mm).

DISCUSSION

These results offer strong support for the hypotheses. The level of arousal does appear to increase with stimulus complexity, or information, and the complex individuals manifest a higher level of arousal at each level of stimulus complexity. This suggests that the complex individual does in fact process more information in attending to the same stimulus as a person with a simpler conceptual style.

These results are not explained in terms of differential habituation of the GSR due to differences in length of exposure. Such an explanation would require evidence that the simple individuals took a longer period of time viewing the stimuli, thus habituating to the experimental procedure, resulting in a diminished GSR. However, in both tasks the complex individuals took a significantly longer average period of time viewing the stimuli (Task A, $t = 1.87$, $df = 99$, $p < .05$; Task B, $t = 1.68$, $df = 199$, $p < .05$). Following such an hypothesis one would expect that the simple individuals would manifest greater arousal.

This identification of individual differences in the level of arousal elicited by stimuli allows the development and testing of *differential* hypotheses concerning preference for complexity based upon the "optimal arousal" theories of preference (e.g., Berlyne, 1960; Dember & Earl, 1956; Fiske & Maddi, 1961) on the basis of characteristic levels of arousal. The findings of the present research are currently being applied to the study of this problem.[2]

The demonstration of differences in characteristic level of arousal in response to information is also significant with regard to complexity theory itself. If the complex individual does in fact receive more information from the same stimulus, is one justified in calling a given physical stimulus "equivalent" for both complex and simple Ss? The proposal of a nonmonotonic function such as is commonly used to relate stimulus complexity and preference would make it necessary to measure the subjective estimate of the complexity of the environment in order to determine the inflection point of the function. The apparent greater information receiving and processing characteristics of the more complex individuals might also serve to explain a troublesome point in complexity research. The theory requires that the optimum information load for integrative activities be at a lower level for the simple individuals than for the complex individuals. While a number of studies have shown that complex individuals engage in more active and integrative decision-making at moderate levels of environmental complexity (Streufert, Driver, & Castore, 1967; Streufert, Driver, & Haun, 1968) only one study to date has reported a difference in optimal level of environmental complexity for decision-making (Streufert & Driver, 1968). From the results of the present research it seems possible that a given level of environmental complexity would, in fact, be reacted to as *more* complex by the complex individuals, thus counteracting any differences in information processing ability as far as optimal level for performance is concerned.

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NOTES

1. Corrected for unequal variances.
2. Bryson, J. B., & Driver, M. J. Conceptual complexity, introversion, and preference for complexity. Unpublished manuscript.