Information processing: The effects of differential pattern complexity and input rate

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Pattern complexity was shown to interact with input rate in affecting information processing. Under high rate, Ss did better on simple than on complex problems; under moderate rate, the reverse was true. High-rate Ss also recalled fewer clues, and used a smaller proportion of the clues they did recall.

One major difficulty in studying complex information processing is the quantification of informational input. While the use of stimuli measurable in "bits" is attractive, it restricts the experimenter to rather simple problems and clues. Another approach has been to employ rate of clue input as the independent variable (Streufert, Suedfeld, & Driver, 1965; Suedfeld & Streufert, 1966); but this procedure ignores the problem of measuring the informative value of the individual stimuli. The study presented here tested the role of pattern complexity (as described in Suedfeld & Hagen, 1966) by independently varying this attribute and input rate. It was hypothesized that the two variables would interact to result in simplified information processing in a highly complex environment.

Procedure

Twenty-six college student volunteers were presented with the problems described in Suedfeld & Hagen (1966). Briefly, these consist of 14 series of ten "clues" each. Every clue was a response reported (Russell & Jenkins, 1954) as having been given to a Kent-Rosanoff Word Association stimulus; all of the clues within a series were responses to the same stimulus. The task was to guess the original stimulus word. The 10 clues in a series, randomly arranged, included the five most popular responses (R_1 - R_5) and five idiosyncratic responses (R_j). In seven of the 14 series (the "flat gradient" group), R_{1-5} carried about the same information value (had been given almost equally frequently by the standardization group); in the other seven (the "steep gradient" group), R_1 was much more probable (had been given much more frequently) than R_2 , R_2 much more probable than R_3 , and so on. The flat gradient group requires that more of the clues be considered and integrated, and thus presents a pattern of higher informational complexity.

Two rate conditions were used, high (clues read 5 sec. apart) and moderate (clues read 15 sec. apart). Thirteen Ss were randomly assigned to the high-rate condition and 13 to the moderate-rate. Each S had seven steep- and seven flat-gradient problems to solve. Measures of information processing were: (a) Number of correct

solutions (final guesses identical with the Kent-Rosanoff stimulus word); (b) Number of clues correctly recalled after each problem; and (c) Proportion of the recalled clues which S said he had considered in making his final guess.

Results and Discussion

In the analyses below, all *t* tests are two-tailed. (a) ANOVA (McNemar, 1962, case XV) of the correct guesses showed that input rate and interaction were significant ($F_s = 9.79$, $p < .01$ and 5.41 , $p < .05$). Many more problems were solved at the moderate rate ($\bar{M} = 2.58$) than at the high rate ($\bar{M} = 1.31$), the difference being of borderline significance for simple patterns ($t = 1.750$, $df = 24$, $.10 > p > .05$) and highly significant for complex patterns ($t = 3.854$, $df = 24$, $p < .001$).

The relative solutions of high- and low-complexity problems showed a reversal under differential input rates. In the moderate rate condition, complex problems were solved more frequently than simple ones ($\bar{M} = 2.58$ vs. 2.39 , $t = 2.000$, $df = 12$, $.10 > p > .05$); under high rate, simple solutions predominated ($\bar{M}_s = 1.62$ vs. 1.00 , $t = 1.862$, $df = 12$, $.10 > p > .05$).

(b) In the moderate-rate condition, more clues were recalled than in the high-rate condition ($\bar{M} = 101$ vs. 85 , $t = 3.587$, $df = 24$, $p < .01$).

(c) In the moderate-rate condition, a higher proportion of the remembered clues was reported by S to have influenced his final guess ($\bar{M} = 81.4\%$ vs. 71.6% , $t = 2.177$, $df = 24$, $p < .05$).

As in previous studies, input rate significantly affected information processing behavior. Complexity of information pattern was found to interact with rate. This variable had not been considered nor controlled in earlier experiments, although the units of information used in those experiments must have varied along this dimension. High rate resulted in impaired processing of information, particularly of complex information (as shown by fewer solutions of complex flat-gradient problems). Furthermore, the processing behavior itself became simpler under high rate: Ss recalled fewer clues and based their decisions on a smaller proportion of the clues they did recall. This behavior apparently simplified the situation to the point where the ignoring of clues led to deterioration in performance. The specific role of individual clues (e.g., the possibility that paying attention to irrelevant clues led the moderate-rate group to do badly on simple problems), and the use of this technique in conjunction with other information processing variables (motivational, social, etc.) remain to be investigated.

References

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Note

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