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#### NOTES

1. I am grateful to many people who kindly commented on an earlier report of this experiment circulated in Autumn 1968. Special thanks are due to Professor John Brown, Dr. John Morton, and Dr. Robert G. Crowder for their encouragement.

2. The results of all t tests were confirmed by means of Wilcoxon tests as a precaution against any serious breakdown in the continuity of the scores.

creative Ss gave more associations, irrespective of the type of stimulus used (noun or adjective, high or low Thorndike-Lorge frequency, or flat or steep associative hierarchy).

The present study investigated the associative output of high and low creativity groups to abstract and concrete stimulus words over longer time periods (3 min). Consistent with Mednick's (1962) conjecture of individual differences in the nature of associative hierarchies, it was predicted that creative Ss would emit a large number of associations at a slow but steady rate across time (flat hierarchy), while less creative Ss would respond frequently, at first, and then rapidly reduce their response rate (steep hierarchy), producing a lower total number of associations. It was further predicted that differences in the slopes of the associative hierarchies between the two groups would be greater when Ss associated to abstract than when they associated to concrete stimulus words. Finally, for all Ss, associative output was predicted to be greater in response to concrete than in response to abstract words.

#### METHOD

The Ss were 30 men selected from the extremes of a group of 300 junior college students who had taken the RAT 4 months prior to the start of the experiment. The 15 Ss in the high-creative (HC) group had RAT scores in the top 14% of the distribution of RAT scores; Ss in the low-creative (LC) group had scores in the bottom 13%.

Stimulus materials were eight words of medium associative hierarchies, selected from Bilodeau & Howell's (1965) association norms. In contrast with steep or flat hierarchy words, a word with a *medium* associative hierarchy elicits some dominant associations and many subsequent associations of gradually declining response strength. All words had a high Thorndike-Lorge (1944) frequency, designated AA MMM in the word count. Half the words were designated as abstract (HOPE, THOUGHT, FRIEND, COLOR) and the other half as concrete (CHILD, FLOWER, PLANT, WATER). Two additional words, APPLE and CARROT, were used as examples.

Each of the 10 words was projected on a screen in front of the S, who was instructed to give as many associations as he could to each stimulus word and to avoid chain-associations. Each word appeared for 3 min and was immediately replaced by the next word in the sequence. Word order was randomized from S to S. All associations were tape-recorded and later transcribed.

## Associative productivity as a function of creativity level and type of verbal stimulus

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*High creative (HC) and less creative (LC) Ss, selected on the basis of the Remote Associates Test (RAT), gave word associations to abstract and concrete word stimuli. HC individuals produced more associations over a longer period of time than did LC Ss, but creativity level did not interact significantly either with type of word stimulus or with associative output across time. Concrete words elicited more associations, but associations evoked by abstract words were more evenly distributed across time. Creativity groups did not differ in degree of stereotypy of the associations produced.*

According to Mednick's (1962) associative conception, creative thinking requires grouping a number of individual

associations into new combinations. The more remote the origins of the various associative elements, the more creative the effort. Mednick & Mednick's (1967) Remote Associates Test (RAT) has been used to discriminate among individuals who differ in ability to think creatively. Each item of the test requires the S to supply a single association appropriate to three unrelated stimulus words. For example, the "correct" association to the three stimulus words, RAT, BLUE, and COTTAGE, would be CHEESE.

On the assumption that ability to generate a large number of associations increases the probability of producing a creative solution, Mednick, Mednick, & Jung (1964) predicted that creative individuals would give a larger quantity of associations to a stimulus than would less creative persons. Their Ss associated continuously for 2-min periods to each of a variety of stimulus words. The more

## RESULTS

The average number of associations given by every S to concrete and abstract stimulus words was computed for 30-sec intervals of the 3-min association period. A Type VI analysis of variance (Lindquist, 1953) was applied to the data. Across the entire 3-min period, the mean number of associations given by HC Ss was 173.5, compared with 128.1 for the LC group. This difference is statistically reliable ( $F = 4.27$ ,  $df = 1/28$ ,  $p < .05$ ). Concrete words produced more associations than did abstract words ( $F = 78.94$ ,  $df = 1/28$ ,  $p < .001$ ), and associative output declined in both groups across the six 30-sec time intervals ( $F = 129.14$ ,  $df = 5/140$ ,  $p < .001$ ). The Stimulus Word by Interval interaction, however, was significant ( $F = 5.19$ ,  $df = 5/140$ ,  $p < .001$ ), indicating that associative output declined more rapidly for concrete than for abstract stimuli. Although the associative output of Group LC decreased more rapidly across time than that of Group HC, the difference in the slopes of the two response curves was not statistically significant ( $F < 1$ ). Furthermore, the interaction of Stimulus Word by Creativity Group by Interval was also not significant ( $F = 1.03$ ).

Another measure of the rate at which the two S groups exhausted their associative reservoirs was obtained by comparing the mean time of occurrence of the final associations given to the stimulus words. In responding to concrete stimuli, the mean time of the last response was 147.8 sec for Group LC, compared with 166.1 sec for Group HC. For abstract stimuli, the mean time was 139.2 and 162.5 sec for LC and HC groups, respectively. Application of the Mann-Whitney U Test revealed the difference between groups to be significant for both concrete ( $U = 60$ ,  $\alpha < .05$ ) and abstract ( $U = 61$ ,  $\alpha < .05$ ) word stimuli. Consistent with this result is the observation that across all stimulus words, after 150 sec, 93% of the Ss in Group HC were still giving associations, compared with 67% in Group LC. After 160 sec, the percentage was 73% for Group HC and only 40% for Group LC.

To determine if associations became more unusual as the S continued associating, a list containing all associations given by all Ss was compiled for each stimulus word separately. Each association was then given a score equivalent to the number of times it appeared in the list. Thus, the higher the score, the more common the response. By subtracting the score for the last association to a stimulus word from that of the first, a measure was obtained of the increase in the uncommonness of the response. The decline in commonness was about 50% in each group when Ss associated to concrete words and about 58% when they associated to abstract words. Group differences were not significant. Comparison of commonness scores of the first association alone revealed no significant differences between groups for either concrete or abstract stimuli.

## DISCUSSION

The present results confirm Mednick, Mednick, & Jung's (1964) finding that the more creative individual shows a greater associative productivity than does the less creative person. The hypothesis that abstract words enhance the difference between creativity groups in the slope of the response gradient over time was not confirmed. Instead, regardless of type of word, both groups showed a rapid and similar rate of decline in associative output across the association period. However, the time required for exhaustion of the associative reservoirs distinguished the two S groups, associative output persisting longer in the more creative group.

The failure to find a significant interaction between creativity group and concrete or abstract stimuli is consistent with Mednick, Mednick, & Jung's (1964) report of nonsignificant interactions between creativity level and type of word (noun-adjective, frequency, associative hierarchy), and also with the results of a previous study by Mandler & Parnes (1957).

Mednick's (1962) prediction that the associative behavior of the high creative person would be less stereotyped was not confirmed. Neither the first nor the last

associations produced by Group HC were more uncommon than those given by Group LC. Moreover, as the association period continued, Group HC did not progress faster than Group LC in producing less stereotyped associations, even in response to abstract stimulus words. The results of the present study suggest that the probability of arriving at a creative solution, as defined by the requirements of the RAT, depends more on the number of associations the S can produce than on their uniqueness. The correct solutions prescribed for the RAT items do not appear to be unusual or idiosyncratic associates. It would seem plausible to characterize the creative person as one who excels in two ways: (1) He can, as Mednick assumes, generate large numbers of associates to each stimulus word, rapidly and for a protracted period, and (2) he can quickly discriminate common elements in the associative clusters surrounding several different stimulus words. The ability to generate and scan associative products may differ from the ability to produce original and statistically infrequent responses.

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## NOTE

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