

Dember (1969). A third condition was run to determine if an increase in $-\Delta t$, without increasing target duration, would result in a decrease in target detectability with these luminance and ISI values. Condition 3 consisted of a 5-msec target with the same $-\Delta t$ as in Condition 2 (see Fig. 1b).

The mean per cent correct, corrected for guessing, obtained under each condition was: Condition 1, 66.20%; Condition 2, 57.00%; Condition 3, 75.80% [$F(2,28) = 8.38, p < .01$]. A Duncan's range test demonstrated that both Conditions 1 and 3 were statistically different from Condition 2 ($p < .01$).

DISCUSSION

Experiment 1 demonstrated that it is possible to reduce the detection (i.e., increase masking) of a black disk target by increasing its duration while holding $-\Delta t$ constant. This suggests that the previous finding that target detection was reduced by increasing target duration is not simply an artifact of increasing $-\Delta t$ (Purcell, Stewart, & Dember, 1969).

In Experiment 2, comparison of the results of Conditions 1 and 2 replicates the previous finding that increasing target duration while holding ISI constant can decrease target detectability (Purcell, Stewart, & Dember, 1969). The finding that Condition 2 yielded less detection than did Condition 3 replicates the results of Experiment 1 in this paper. The finding that Condition 1 did not yield more detection than did Condition 3 indicates that, with the parameters used in this study, increases in $-\Delta t$ alone do not

decrease target detection. The finding that Condition 3 gave more correct detections than did Condition 1 indicates that the results of Experiment 1 may be the result of decreased ISI. However, the finding that Condition 2 gave fewer correct detections than did Condition 1 indicates that increased target duration served to reduce target detections even further than simply decreasing ISI. Purcell, Stewart, & Dember (1968) have used the concept of lateral inhibition in explaining visual backward masking, and these results support the interpretation they have proposed.

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NOTE

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develop the ability to assign objects to their corresponding schema families on the basis of the information derived from perceiving the objects, without any other external source of information regarding the appropriate categorization and without prior familiarization with the relevant schemata. The basis for this process is assumed to be the overdetermination of the categories or, in other words, the redundant information associated with the categories.

Many of the significant learning situations involve concept formation, and yet knowledge of this important process is limited. The process of SCF has been demonstrated and related to stimulus and task variables in a number of studies (Brown, Walker, & Evans, 1968; Edmonds & Mueller, 1967b; Rosser, 1967; Evans & Edmonds, 1966). The present study investigated the relationship between SCF and intelligence, as measured by the California Test of Mental Maturity (CTMM).

It was hypothesized that a positive correlation would be found between scores on the CTMM and scores on a SCF test for adolescent Ss. Because SCF does not involve language, a significantly higher correlation was expected between the SCF test and the nonlanguage subtest of the CTMM than between the SCF test and the language subtest. Also, on the basis of observations made during previous SCF research, it was hypothesized that a significant difference would be found between the male and female Ss on their SCF test scores.

SUBJECTS

Sixty adolescent children (mean age, 16 years) were selected on the basis of CTMM total IQ scores. Ten male and 10 female Ss were selected from the following three IQ groups: subnormal, IQ range from 70 to 85 (mean = 77); average, IQ range from 90 to 109 (mean = 100); and superior, IQ range from 120 to 140 (mean = 129).

STIMULI

The VARGUS 9 system (Evans & Mueller, 1966) produces patterns of numbers randomly sampled from a defined population having specifiable information or redundancy characteristics. The sequence of numbers may be mapped into proportional column heights, resulting in patterns described as histoforms, or the numbers may be plotted like a line graph, as illustrated by Rankin & Evans (1968). The stimuli used by Rankin and Evans were also used in this study. The stimuli represented examples of two schema families at 70% redundancy.

PROCEDURE

The SCF task described by Rankin & Evans (1968) was used as a measure of SCF

Schematic concept formation in relationship to mental ability in adolescents

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The relationship between schematic concept formation (SCF) and intelligence was studied with adolescent Ss. Sixty Ss (mean age 16 years) performed a two-schema discrimination task using stimuli generated by the VARGUS 9 computer system. Intelligence quotients of Ss ranged between 70 and 140, as measured by the California Test of Mental Maturity. Positive correlations were found between the SCF test and the CTMM total

score ($r = .36$), CTMM language score ($r = .28$), and the CTMM nonlanguage score ($r = .42$). No relationship between SCF and sex was found. Potential utility of the SCF task in studies of individual differences in learning are discussed.

Schema theory proposes that humans abstract and use the redundant aspects of the environment to reduce information processing and storage requirements. Evans (1967a) proposed schematic concept formation (SCF) to account for schema learning under environmental conditions in which humans are confronted with instances of various schema families mixed together. According to this theory, humans

ability. In this task, Ss were presented with booklets containing 60 pairs of stimuli, 1 pair on each page. Ss were asked to make a dichotomous judgment ("similar" or "different") with respect to whether the two stimuli on a page were from similar or different schema families. In instructions similar to those used by Rankin and Evans, Ss were told that the stimuli did not have to be identical to be judged "similar."

The Ss were tested in groups of 10, with the same instructions being given to all groups. No time limit was imposed.

RESULTS

A significant positive (product moment) correlation was found between performance on the SCF test and the total CTMM IQ scores ($r = .36$, $p < .01$). The correlation between SCF scores and the CTMM language scores was $.28$ ($p < .05$). The correlation was $.42$ ($p < .01$) between the SCF scores and the CTMM nonlanguage scores. A t test of differences between the coefficients of correlation supported the hypothesis ($p < .05$) that a higher correlation would be obtained between SCF performance and the nonlanguage scale than between SCF and the language scale.

A two-factor analysis of variance, with IQ and sex as independent variables and the SCF scores as the dependent variable, indicated a significant main effect associated with IQ ($F = 5.30$, $df = 2/54$, $p < .01$). Neither the main effect of sex nor the interaction effect between IQ and sex was significant. A Newman-Keuls test indicated significant differences ($p < .01$) between the SCF scores of the subnormal and the average groups and also between the subnormal and the superior groups of Ss. There was no difference in SCF performance between the average and superior groups.

DISCUSSION

The majority of the research with SCF has used college students as Ss. This research showed that 16-year-old Ss are able to form concepts from nonverbal, unfamiliar stimuli, and that this ability is positively related to IQ as measured by the CTMM. Thus, the present study demonstrated that younger Ss could perform adequately on the SCF test. Further research is needed to extend these studies to still younger age levels to determine the age at which SCF ability begins. Since SCF seems to represent a fairly complex cognitive task, this test may be relevant to developmental theories of cognition.

The results indicate that IQ (as measured by the CTMM) and SCF share a modest amount of common variance. The CTMM

total IQ would account for approximately 13% of the variance of performance on the SCF task, while the nonlanguage portion of the CTMM would account for approximately 18% of the SCF performance. This relationship may be of interest both in the context of research on SCF and in connection with the assessment of intelligence.

With respect to research on SCF, experimental designs have not previously controlled for individual differences, except by means of repeated measures. On the basis of the present research, it appears that a significant contribution to the total variance is made by individual differences. In the absence of appropriate controls, the variance associated with individual differences appears as error variance in the analysis of the results. The present study would suggest that a portion of this error variance could be removed by removing variance associated with intelligence through a randomized-blocks design or an analysis of covariance.

With respect to the measurement of intelligence, the SCF task is of interest for several reasons. First, it is largely nonverbal in nature and, thus, might be relatively free from the effects of training in verbal skills. The fact that the SCF performance correlated more highly with the nonlanguage subtest than with the language subtest supports the view that the SCF task is more dependent on nonverbal than upon verbal skills.

A second aspect of interest is that the stimuli used in the study of SCF are relatively unfamiliar to most Ss, and performance on the task is substantially dependent on what the Ss can learn on the task itself. Thus, the task appears to be a test of a particular kind of learning ability rather than a test of what has already been learned. Most tasks that require learning also require knowledge of results or some sort of evaluative feedback. But SCF is accomplished without external feedback and, thus, is more suitable for administration as a paper-and-pencil task.

A third reason for interest in SCF with respect to measurement of intelligence is the existence of a methodology (Evans, 1967b; Evans & Mueller, 1966; Evans & Breckenridge, 1968) for the quantification of levels of difficulty and of other characteristics of the task. The task is, furthermore, related to other tasks of interest in the area of perception (Lane, 1968; Lane & Evans, 1968; Brown, Walker, & Evans, 1968; Edmonds & Mueller, 1967a) and cognition (Edmonds, Evans, & Mueller, 1966; Hollier & Evans, 1967; Rosser, 1967; Shipstone, 1960).

The results of the present study suggest that the relationship between SCF and

cognitive abilities merits further exploration.

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NOTE

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