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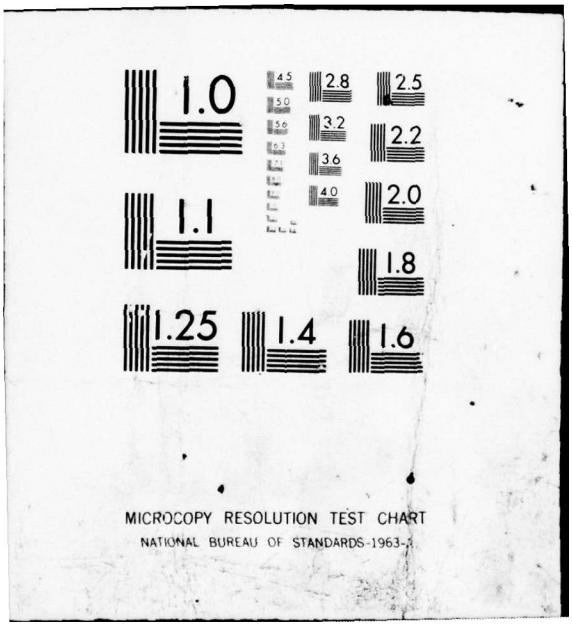
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COGNITIVE STYLES:
A BIBLIOGRAPHY AND SELECTED ANNOTATIONS

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TECHNICAL TRAINING DIVISION
Lowry Air Force Base, Colorado 80230

May 1979
Interim Report for Period January 1977 – January 1978

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This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

MARTY R. ROCKWAY, Technical Director
Technical Training Division

RONALD W. TERRY, Colonel, USAF
Commander

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18. SUPPLEMENTARY NOTES

The study reported herein is basic research which may be of interest only to a limited audience. Volume I of this report is a state-of-the-art summary of cognitive styles, based on a review of the literature listed in Volume II.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

cognitive styles
conceptualizing style
field dependence-independence
impulsivity-reflectivity
learning styles
leveling-sharpening
perceptual styles
technical training
tolerance for unrealistic experience
visual-haptic style

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The bibliography entries and annotations presented in this report are the result of an extensive review of research literature concerning cognitive style constructs and their measuring instruments. Ten cognitive styles were identified as most relevant. This bibliography was the basis from which the review of the cognitive style literature (AFHRL-TR-78-90(I)) was written.

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SUMMARY

The bibliography entries and annotations presented in this report are the result of an extensive review of research literature concerning cognitive style constructs and their measuring instruments. Ten cognitive styles were identified as most relevant and (with only a few exceptions) are the subjects of investigation in the studies listed. These cognitive styles include:

(1) Field dependence-independence
(2) Impulsivity-reflectivity
(3) Visual-haptic
(4) Leveling-sharpening
(5) Distractibility (constricted-flexible control)
(6) Breadth of categorization
(7) Scanning-focusing
(8) Tolerance for unrealistic experiences
(9) Cognitive complexity
(10) Conceptualizing style

The bibliography entries in each section are listed in alphabetical order in accordance with the American Psychological Association guidelines (APA Publication Manual). The annotated bibliography section also includes abstracts which in most cases are organized around the subject, method, and results of each study covered.

The approach included the following:

1. An extensive search of the literature was accomplished with the aid of automated computer searches such as GYPSIE, Psychological Abstracts, Dissertation Abstracts, and by conventional means. This search produced approximately 3500 citations.
2. Journal articles, books, dissertations, and other materials identified in the literature search were obtained and reviewed.
3. Relevant materials were then inserted into an automated computerized retrieval system set up for this project. Each citation was then accessible from the system not only by author and title but also by a specific code as to its relative importance to the project.
4. Selected bibliographical entries were chosen to be annotated because of their special significance to the research effort.

This bibliography and annotations of works dealing with the cognitive styles constructs were the basis from which the written review of the cognitive style literature was done. The written review of the literature concerning the ten cognitive styles is presented in AFHRL-TR-78-90(I).

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SECTION I

COGNITIVE STYLES

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Zawacki, A. An experimental study of analytic synthetic modelings and drawings of children (Doctoral dissertation, Pennsylvania State University, 1956). Dissertation Abstracts International, 1956, 16, 1380. (University Microfilms No. 00-16737)

Zelniker, T., Jeffery, W.E., Ault, R., & Parsons, J. Analysis and modification of search strategies of impulsive and reflective children on the Matching Familiar Figures Test. Child Development, 1972, 43, 321-325.

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SECTION II

COGNITIVE STYLES

SELECTED ANNOTATED BIBLIOGRAPHY

Baird, R.R., & Bee, H.L. Modification of conceptual style preference by differential reinforcement. Child Development, 1969, 40, 903-910.

SUBJECT: Modification of analytic and non-analytic conceptual styles through reinforcement training.

METHOD: First- and second-grade children were pre-tested for analytic and non-analytic conceptualizing styles. Analytic and non-analytic children were randomly assigned to analytic and non-analytic training groups. During training, reinforcement---in the form of chips exchangeable for candy---was given for either analytic or non-analytic responses. The children were then post-treated for conceptualizing style.

RESULTS: Where training was consistent with pre-test performance, analytic children became even more analytic with training, but non-analytic children showed little change on the post-test. Where training was contradictory to pre-test performance, non-analytic children given analytic training showed an increase in analytic performance on the post-test, but analytic pre-test level of analytic functioning on the post-test.

Berkowitz, L. Leveling tendencies and the complexity-simplicity dimension. Journal of Personality, 1957, 25, 743-752.

SUBJECT: The author examines the relationship between leveling and the complexity-simplicity dimension of personality, hypothesizing that individuals indicating a preference for simple phenomenal experiences have strong leveling tendencies.

METHOD: Forty-six students in a college psychology course (16 males, 30 females) were given two memory tasks: In the first, students were asked to draw a series of five designs from memory after seeing them displayed in front of the class. In the second task, subjects first copies a paragraph and then tried to reproduce the paragraphs from memory. No time limits were imposed on either task. An attitude questionnaire was also administered which contained complexity and ethnocentrism scales.

RESULTS: The data were analyzed by chi-square tests. After dichotomizing each of the two leveling tendency distributions about their respective medians, a test was made of the significance of the association between the two leveling scores, yielding a chi square value of 6.67, $p < .01$. This suggests that the two leveling tasks are significantly related. As predicted, the complexity score was negatively related to leveling tendencies, $chi^2 = 7.38$, $p < .05$.

The researcher concluded from this that individuals who prefer simple phenomenal experiences achieve this simplicity by leveling.

Bieri, J., Atkins, A.L., Briar, J.S., Leaman, R.L., Miller, H., & Tripodi, T. Clinical and Social Judgement: The Discrimination of Behavioral Information. New York: Wiley, 1966.

SUBJECT: This book is a major analysis of the "differentiation" conceptualization of cognitive complexity/simplicity. The authors discuss this conceptualization, present considerable data concerning it, and explain a procedure for assessing it which is a modification of Kelly's original REP test.

Block, J., Block, J.H., & Harrington, D.M. Comment on the Kagan-Messer reply. Developmental Psychology, 1975, 2, 249-252.

SUBJECT: A response to the arguments made by Kagan and Messer in response to an article questioning the conceptualization, operationalization, validity and interpretation of reflection-impulsivity. This comment points to the fact that the researchers continue to disagree on a number of the issues raised.

Block, J., Block, J.H., & Harrington, D.M. Some misgivings about the Matching Familiar Figures Test as a measure of reflection-impulsivity. Developmental Psychology, 1974, 5, 611-632.

SUBJECT: An exploration of the discrepancy which seems to exist between Kagan's conceptualization of reflection-impulsivity and its operationalization on the Matching Familiar Figures Test. The researchers describe the discrepancy between Kagan's conceptualization of reflection-impulsivity and his operationalization of reflection-impulsivity; the construct validity of the Matching Familiar Figures Test through a literature survey is reported, and research findings are also reported.

METHOD: 100 subjects (50 boys, 50 girls), between the ages of 48 and 51 months were administered the MFF. The subjects were split into quadrants fast/accurate, fast/inaccurate, slow/accurate, slow/inaccurate, thereby accounting for all subjects. The California Child Q Set was used to develop personality characterizations for each child.

RESULTS: 61% of the subjects fall into the 2 quadrants typically analyzed in MFF research; 39% fall into the

quadrants typically called "indeterminant" and are ignored. Figures for internal consistency reliability and stability or across-time correlations are in accord with the literature. A 2 X 2 analysis of variance was used to evaluate the 100 Q items associated with MFF error, MFF latency and the interaction of MFF error and latency; 2 were significantly related to MFF latency and 32 were significantly related to MFF error. The accurates tend to be brighter, more competent and resourceful children, the inaccurates tend to be lacking in self-confidence, more rigid and less happy children. The fast/ inaccurates seem to be unable to withhold their responses due to intense anxiety, a finding which contradicts Kagan!s theory. It also appears that latency does not contribute as much as errors in defining this cogntive variable.

Bone, R.N., & Eysenck, H.J. Extraversion, field dependence, and the Stroop Test. Perceptual and Motor Skills, 1972, 34, 873-874.

SUBJECT: This study sought to supplement a personality questionaire measuring extraversion with measures of field dependence-independence and distractibility and to determine the relationships among the scores.

METHOD: A student sample consisting of 97 males and 97 females, mean age 20 years, was tested. Eysenck's personality inventory measuring extraversion, neuroticism, and psychoticism was used; the field dependence test used was Witkin's Rod and Frame Test, and the Stroop Test was used to measure distractibility.

RESULTS: The matrices of correlations were factor analyzed using a principal components method. For men, the first factor had high loadings on the Stroop scores and, therefore, was test specific. The second factor had loadings on the three personality variables. The third factor had loadings on extraversion, field dependence, and the Stroop interference scores but negative loadings on the Stroop times scores. Women's results followed the same lines, but the results were less clear. Their field dependence scores were much higher than the men's. Loadings for extraversion, Stroop interference, and Stroop time scores were much lower than for men. In general, the researchers conclude that extroverts are field dependent, more prone to interference, and quicker to read the simple Stroop cards.

Bruning, W.A. Visual aptitude as it relates to student achievement in reading and mathematics (Doctoral dissertation, 1974). Dissertation Abstracts International, 1975, 35, 5212A. (University Microfilms No. 75-02963)

SUBJECT: Relationship between visual aptitude as measured by Lowenfeld's visual/haptic dimension and school achievement in reading and math.

METHOD: A sample of high school students were given Successive Perception Test I as a measure of their visual aptitude. Their visual aptitude scores were correlated with their scores on standardized achievement tests in reading and math.

RESULTS: Significant positive correlations were found between visual aptitude and achievement in both reading and math.

Bush, E.S., & Dweck, C.S. Reflections on conceptual tempo: Relationship between cognitive style and performance as a function of task characteristics. Developmental Psychology, 1975, 5, 567-574.

SUBJECT: The purpose of this study was to investigate whether reflective subjects would continue to show superior performance on tasks stressing speed, that is, demonstrate a flexibility of response style.

METHOD: 100 fourth grade students, 54 girls and 46 boys, were selected from a pool of 225 children based on test anxiety and conceptual tempo scores. The subjects were administered the Test Anxiety Scale for Children (TASC) and Lie Scale for Children (LSC); two weeks later the Matching Familiar Figures Test, an index of impulsivity/reflectivity, was administered. The subjects were classified as high-anxious or low-anxious, and impulsive or reflective and placed in groups as high anxious reflective, low-anxious impulsive. Two months later, each subject was tested for 20 minutes and given 3 tests that required quick decision making.

RESULTS: Separate 2 x 2 analyses of variance (anxiety x conceptual tempo) were performed for each sex on nine dependent variables. The results revealed that the high-anxious reflective performed as well as the low-anxious reflectives. It appears that the reflectives were able to adapt to the demands of the tests on both speed and accuracy better than the impulsives. This research reveals that although longer latency is a characteristic of reflective individuals, they appear to have the ability to respond quickly and accurately to tasks that stress speed.

Butler, P.A. The relationship of age, gender, analytical ability, field articulation, and leveling-sharpening to assimilation tendencies in time-error (Doctoral dissertation, University of Oklahoma, 1977). Dissertation Abstracts International, 1977, 38, 1989A. (University Microfilms No. 77-21366)

SUBJECT: This study investigated the relative contributions of age, gender, analytical ability and two cognitive controls, leveling-sharpening and field dependence-independence to time-error in a series of visual tasks of comparative judgement. It was proposed that age, gender, and analytical ability contribute to the development of the two cognitive controls which in turn contribute to the dependent variable (time-error) in an antecedent-succedent type relationship.

METHOD: The complex set of interrelationships among the independent variables was investigated by a path analysis procedure. Three multilinear regression analyses were run to determine relative contributions of the first three variables (age, gender, and analytical ability) to field articulation; the contribution of age gender, and field articulation to leveling-sharpening; and the relative contribution of all the factors to time-error assimilation behavior.

RESULTS: The first regression analysis (within the context of a path analysis) indicated that together analytical ability and age account for 41% of the variance in field articulation. None of the other regression analyses yielded significant multiple correlation coefficients. This supports prior findings by Witkin and indicated analytical ability to be a stronger predictor than age. Possible reasons for the outcome of this study were discussed as well as possible future research.

Drewes, H. An experimental study of the relationship between electroencephalographic imagery variables and perceptual-cognitive processes (Doctoral dissertation, Cornell University, 1958). Dissertation Abstracts International, 1958, 19, 87. (University Microfilms No. 02438)

SUBJECT: Brain alpha waves as a physiological aspect of visual-haptic functioning.

METHOD: Alpha rhythms of subjects were recorded as they attempted to mentally visualize and manipulate geometric figures on a table top. Since alpha rhythm typically ceases when a visual image is seen or is induced mentally, it was concluded that those individuals who recorded persistent alpha were not

forming visual images, while those who recorded no alpha were constantly producing mental imagery. Based on alpha rhythm recordings, the subjects were divided into visualizers, nonvisualizers, and responsives. All subjects were then given a Rorschach Test.

RESULTS: The Rorschach responses of the visualizers tended to be whole and three-dimensional forms, while those of the nonvisualizers tended to be more kinesthetic and non-visual in nature.

Erickson, R.C. Visual-haptic aptitude: Effect on student achievement in reading. Journal of Learning Disabilities, 1969, 2(5), 21-25.

SUBJECT: Relationship of visual-haptic type to reading achievement.

METHOD: A group of 325 seventh grade boys from four schools were given Successive Perception Test I to determine perceptual type. Their grade-equivalent scores on the reading portion of the Iowa tests of basic skills were obtained from their school records. Anova techniques were used to examine the relationship between reading achievement level and visual-haptic indeterminate perceptual type.

RESULTS: The mean reading level of the visual group was found to be significantly greater than that of the indeterminate group. Both of these groups were found to have a higher level of reading achievement than the haptic group.

Flick, P. An intercorrelative study of two creative types: The visual type and the haptic type (Doctoral dissertation, Pennsylvania State University, 1960). Dissertation Abstracts International, 1961, 21, 2586. (University Microfilms No. 61-00035)

SUBJECT: Expression of visual and haptic nature in literary work.

METHOD: Subjects of both the visual and haptic types were asked to produce pieces of creative writing. These were then analyzed for evidence of visual and haptic expression.

RESULTS: Visuals tended to produce literary expression which was sight-oriented, objective and externally directed. Haptic expression was more kinesthetic, subjective, and internally directed.

Frick, J.W., Guilford, J.P., Christensen, P.R., & Merrigield, P.R. A factoranalytic study of flexibility in thinking. Educational and Psychological Measurement, 1959, 19, 469-495.

SUBJECT: Relationship of compartmentalization in conceptualizing style to measures of divergent thinking.
METHOD: A group of adult males were tested for compartmentalization with a sorting task. They were also tested on a group of divergent-thinking measures, such as spontaneous flexibility and idea fluency. Relationships were studied with correlational and factor analyses.
RESULTS: Subjects with high degrees of compartmentalization tended to do poorly on the divergent-thinking measures and factors. Those with more flexible and divergent thought processes tended to leave few compartmentalized stimuli when sorting, suggesting more flexible boundaries when grouping or conceptualizing the stimuli.

Friedman, R. Relationship between intelligence and performance on the Stroop Color-Word Test in second and fifth grade children. Journal of Genetic Psychology, 1971, 118, 147-148.
SUBJECT: The researcher sought to determine the relationship between performance on the Stroop Test and intelligence in young children.
METHOD: Subjects were 47 second grade and 46 fifth grade boys and girls. Mean ages were 7.8 years and 9.9 years, respectively. I.Q.'s of the second grade subjects ranged from 84 to 123, with a mean of 106. I.Q.'s of the fifth grade subjects ranged from 90 to 130 with a mean of 110.
RESULTS: On the word card, a significant correlation of -.34 was found for second grade subjects ($p < .01$). Significant correlations of -.41 and -.44 ($p < .01$) were obtained for time scores and intelligence scores for the fifth grade subjects on word and color-word cards, respectively. For second graders, a significant correlation of -.44 ($p < .01$) was obtained on the color cards. The researcher concluded that intelligence must be taken into account when the Stroop is used with young children and when time is used as the criterion measure.

Gardner, R.W., & Lohrenz, L.J. Leveling-sharpening and serial reproduction of a story. Bulletin of the Menninger Clinic, 1960, 24, 295-304.
SUBJECT: Based upon previous research findings relating leveling to repression, the researchers hypothesize that levelers would differ from sharpeners when transmitting a story in these ways: In the number of story themes retained; in the number of themes

transposed or contaminated with other themes; and in the number of new themes imported into the story.

METHOD: The subjects were five women levelers and five women sharpeners, based upon their scores on the schematizing test. They ranged in age from twenty-one to thirty-seven. Levelers were tested in one session, sharpeners in another, on serial reproduction of a folk tale entitled "The Son Who Tried to Outwit His Father." The experimenter first told the story to a subject, who in turn told it to the next subject, and so on, in "Game of Gossip" fashion.

RESULTS: Levelers lost more themes (79 vs. 116), lost the overall structure of the story, and presented more fragmented productions than sharpeners. Because of the interdependence of the subjects' serial reproductions within the two groups of subjects, no statistical tests of group differences were run. However, the overall differences between the two groups were striking.

Gardner, R.W., & Long, R.I. Leveling-sharpening and serial learning. Perceptual and Motor Skills, 1960, 10, 179-185.

SUBJECT: The relationship between leveling-sharpening and serial learning was investigated, specifically with regard to: a) amount learned, b) number and nature of intralist intrusions, c) number of intralist transpositions (in learning and recall), and d) number of words recalled.

METHOD: Ten women levelers and ten women sharpeners, ranging in age from twenty-one to thirty-seven, were tested. Leveling-sharpening was measured by the Schematizing Test; the Serial Learning Test was administered via an electronic memory drum, subjects were given two eight-word lists. All of the words were similar, in that they all began and ended with the same letters. A one-tailed T-test was used for analysis.

RESULTS: Although sharpeners tended to give more responses, they made fewer errors. They made significantly fewer backward errors than levelers ($p < .02$).

Gardner, R.W., Holzman, P.S., Klein, G.S., Linton, H.B., Spence, D.P. "The constricted-flexible control principle," Cognitive control: A study of individual consistencies in cognitive behavior. Psychological Issues, 1959, 1, 53-66.

SUBJECT: This review article describes the constricted-flexible control and the tests used for its measurement,

The constricted-flexible variable is defined as differing reactions to stimulus fields containing contradictory or intrusive cues. Gardner and his colleagues point out that this variable is in many ways similar to Witkin's construct field independence-field dependence.

Golden, C.J. A group version of the Stroop Color and Word Test. Journal of Personality Assessment, 1975, 39, 386-388.

SUBJECT: This study attempted to develop a form of the Stroop that could be used in both group and individual settings. The group test does not require a spoken response.

METHOD: Subjects were 240 college undergraduate and 300 high school students. Average age within the sample was 18. The test consisted of three pages stapled together. The first page consisted of word colors in black ink. On the second page the items were X's colored in red, green, or blue ink. On the third page the words for colors were printed in inappropriate colors. Thirty subjects took the individual form of the test twice; sixty took both forms; and 240 took the group form twice.

RESULTS: Reliabilities for the group form were .89, .84, and .73 for the word, color, and color word pages, respectively. For the subjects taking both forms, cross-form reliabilities were .85, .81, and .69. The researchers concluded that the two forms of the test are equivalent and can be used interchangeably.

Gottesman, M. A comparative study of Piaget's developmental schema of sighted children with that of a group of blind children. Child Development, 1971, 42, 573-580.

SUBJECT: Haptic perception as a matter of conversion of kinesthetic experiences to visual imagery versus haptic perception as direct kinesthetic learning.

METHOD: Two groups of sighted children (N = 15 each) and one group of congenitally blind children (N = 15) were given three-dimensional shapes to experience tactually only. One sighted group was then asked to match the shapes they had felt from four figures in a visual display. The second sighted group and the blind group were asked to respond tactually by identifying the shapes by touch.

RESULTS: No significant differences in percentage of correct responses were found among any of the groups. This caused Gottesman to question Piaget's contention that haptic perception is a matter of conversion of

kinesthetic experiences to visual imagery. Although it cannot be known whether sighted children using tactile impressions only were mentally making the conversion to visual images, it is doubtful that the congenitally blind children were doing so.

Harvey, O.J., Hunt, D.E., & Schroder, H.M. Conceptual Systems and Personality Organization. New York: Wiley, 1961.

SUBJECT: This book is the original discussion of an "integrative complexity" conceptualization of cognitive complexity/simplicity. The authors discuss this conceptualization and identify four levels of abstraction/concreteness or integrative complexity. The book is the foundation of the conceptual-systems theory of cognitive complexity.

Harvey, O.J., White, B.J., Prather, M.S., Alter, R.D., & Hoffmeister, J.K. Teachers' belief systems and preschool atmospheres. Journal of Educational Psychology, 1966, 57, 373-381.

SUBJECT: Educational atmospheres produced by teachers with varying levels of integrative cognitive complexity.

METHOD: A sample of Head Start teachers were tested for integrative cognitive complexity and consequently assigned to one of 3 conceptual "systems". Trained observers then rated the teachers on 26 behavioral dimensions which reflected the kind of educational atmosphere they fostered. A cluster analysis was used to study the dimensions underlying the 26 dimensions.

RESULTS: Two major "atmospheres" clusters were obtained: "dictatorialness" and "task orientation." Several significant differences were found on both clusters for teachers with different conceptual systems.

Holtzman, P.S. Cognitive attitudes of leveling and sharpening in time-error assimilation tendencies (Doctoral dissertation, University of Kansas at Lawrence, 1952).

SUBJECT: Noting strong individual consistencies in a previous time-error study (Koester, T. Time-error and sensitivity in pitch and loudness discrimination. Archives of Psychology, May 1945, p. 297.), Holtzman hypothesized there might be a relationship between the dimension of leveling-sharpening and assimilation tendencies in the time-error: that levelers would show more of a tendency to assimilate memory traces than sharpeners.

METHOD: Holtzman devised the schematizing test to measure leveling-sharpening, which measures the ability of the subject to keep up with projected squares which systematically increase in size. He tested 43 young adult subjects, male and female, 21 of whom were extreme sharpeners and 22 of whom were extreme levelers. He performed a time-error experiment in each modality: visual, auditory, and kinesthetic.
RESULTS: Through an analysis of variance, Holtzman found that levelers and sharpeners do differ in the predicted direction on assimilation effects in time-error: that levelers show a greater tendency to assimilate traces to the interpolated field. In each modality, the differences were significant at the .05 level or less.

Holzman, P.S., & Gardner, R.W. Leveling and Repression. Journal of Abnormal and Social Psychology, 1959, 59, 151-155.
SUBJECT: Because levelers obscure size and weight differences in tests of successive comparison on the schematizing test, the researchers hypothesized that levelers would tend to use repression as a way of coping with conflict.
METHOD: Subjects were ten extreme levelers and ten extreme sharpeners selected from a larger group of eighty by their performance on the schematizing test. They were female university students ranging in age from 18 to 21. The Rorschach test was administered individually to each subject. The twenty records were then rated on a four-point scale indicating the degree of the subjects's reliance on repression as a defense. None of the raters knew which subjects were levelers or sharpeners.
RESULTS: Six subjects, all levelers, received an average rating of 3.00 or above, indicating a strong tendency to use repression as a defense. Of the remaining fourteen subjects who rated lower in reliance on repression, ten were sharpeners and four were levelers. The researchers concluded that there is a link between repression and leveling, but the exact nature of the link remains to be determined.

Holzman, P.S., & Klein, G.S. The "schematizing process": Perceptual attitudes and personality qualities in sensitivity to change. American Psychologist, 1950, 5, 312.

SUBJECT: Individual differences in response to changing stimuli are described; these differences are labeled leveling-sharpening, and they are related to personality qualities.
METHOD: Fifty adult men and women were tested by use of the schematizing test, which presents to the subject squares of successively increasing size. The subject was to judge the size of each projected square.
RESULTS: The group dichotomized into those who increasingly underestimated the size of the squares and those who shifted appropriately throughout. With Q-technique, using a trait universe compiled from Murray's definition of needs, these groups were found to be related to personality qualities labeled a self-constriction vector and a self-outward vector.

Isakson, M., & Moore, J.W. The effects of training of analysis upon the responding style of impulsive children. AERA, 1972.
SUBJECT: Impulsive students need training in analysis to reduce errors on tasks requiring analytic processing. This study attempted to alter impulsive behavior to more reflective behavior through reduction of number of errors.
METHOD: Thirty-four second grade boys were selected who were identified as impulsive on the MFF. After a pretest, the experimental group received three phases of training in analytic relationship training, detail recall training, and detail matching training; this was followed by a post test. A series of analyses of variance was used to analyze the data.
RESULTS: The subjects in the experimental group made fewer errors than the subjects in the control group. This result seems to indicate that attention to details may increase accurate response behavior. Because response time was not increased as errors decreased, it is postulated that latency and errors are independent.

Kagan, J., & Messer, S.B. A reply to "Some misgivings about the Matching Familiar Figures Test as a measure of relection-impulsivity." Developmental Psychology, 1975, 2, 244-248.
SUBJECT: An attempt to clarify issues raised by Block, Block, and Harrington regarding the conceptualization, operationalization, validity and interpretation of reflection-impulsivity.

METHOD: Relevant research is cited and interpretation of results offered to clarify points of discrepancy raised by Block, Block and Harrington.
RESULTS: Although the authors believe Block, Block and Harrington have raised some important issues concerning reflection-impulsivity, the latter researchers are basing their criticisms on work with pre-school children and the implications of the MFF are different for older children.

Kagan, J., Moss, H.A., & Sigel, I.E. Psychological significance of styles of conceptualization. In J.C. Wright and J. Kagan (Eds.). Basic cognitive processes in children. Monographs of the Society for Research in Child Development, 1963, 28, No. 2, (serial no. 86).
SUBJECT: Implications and correlates of preference for analytic conceptualizing style in children and adults.
METHOD: Eight different studies are reported, using a variety of types of subjects, stimulus material, and analysis methods.
RESULTS: A variety of findings are reported, including consistencies of conceptualizing style across several types of behaviors, personality and behavioral correlates of conceptualizing styles, ability and learning performance correlates of conceptualizing styles, and sex and age differences in conceptualizing styles.

Kagan, J., Pearson, L., & Walch, L. Modifiability of an impulsive tempo. Journal of Educational Psychology, 1966, 6, 359-365.
SUBJECT: Two tutoring conditions were used to train impulsive first graders to become reflective. After training both groups showed longer response latencies.
METHOD: A group of 155 first grade children were administered the MFF. Forty children were chosen for each training group. In one group the experimenter persuaded the children that they had showed interests and attributes; in another group the experimenter did not persuade at all. The training procedure emphasized the inhibition of impulsive answers but did not provide training in improved visual scanning techniques or analytic reasoning.
RESULTS: It appears that the only important result of the training was to increase the response latencies of the subjects to the MFF. Error scores were not much affected by the training. The study demonstrated that impulsive children may be taught to modify their behavior.

Karp, S. Field dependence and overcoming embeddedness. Journal of Consulting Psychology, 1963, 27, 294-302.

SUBJECT: This study evaluates two alternative hypotheses: That field dependence involves the ability to overcome embedding contexts; and that field dependence involves the ability to resist distraction. Distraction situations are operationally defined by Karp as those in which irrelevant stimuli surround or intersect critical test items that must be located or manipulated by the subject. This is somewhat different from embeddedness situations, in which the critical item is organized into new and competing gestalts. In the distraction situation, the figural properties of critical items remain intact.

METHOD: Subjects were 150 undergraduate males, ages from 17 to 43 years. The researcher administered the Body Adjustment Test, Rod and Frame Test, Embedded Figures Test (all of the above designed by Witkin); 6 subtests of the WAIS, match problems and insight problems (both tests of adaptive flexibility), digit symbol, three distracting contexts test, and arithmetic operations. Karp ran a factor analysis, rotating 4 and 8 factors. Loadings of .25 or greater were considered significant.

RESULTS: There was a complete absence of overlap of significant loadings of tests involving different kinds of contexts on either 4 or 8 factor solutions. Four of the 7 factors involved attention, memory, or concentration. Karp's major conclusion from the study was that the ability to overcome embeddedness is factorially different from the ability to resist distraction.

Kelly, G.A. The Psychology of Personal Constructs, Vol. 1. New York: Norton, 1955.

SUBJECT: This book is the original work in cognitive complexity/simplicity. The author discusses the idea of personal constructs and their classification as simple or complex. He also describes the Role Construct Repertory (REP) Test for measuring cognitive complexity. He also discusses his view of personal constructs as dynamic rather than static, changing with time and experience.

Kogan, N. Educational implications of cognitive styles. In Lesser, G. (Ed.). Psychology and Educational Practice. Scott Foresman & Co., Glenview. Il. C. 1971.

SUBJECT: This article gives a thorough review of ten different cognitive styles that have been identified and researched.

METHOD: Each cognitive style was discussed in terms of theory, research, and educational implications. The ten cognitive styles discussed include: field dependence-independence, scanning, breadth of categorization, conceptualizing styles, cognitive complexity vs. simplicity, reflectiveness vs. impulsivity, leveling vs. sharpening, constricted vs. flexible control, tolerance for incongruous or unrealistic experiences, and risk taking.

RESULTS: The author concludes that in general the cognitive style dimensions are internally consistent and relatively stable over time, with a trend toward generality clearly present in most of them. He encourages the development of long term cognitive strategies that are of adaptive value within as well as outside the classroom and feels this can be done if "energy and imagination are applied to the task."

Lee, L.C., Kagan, J., & Rabson, A. Influence of a preference for analytic categorization upon concept acquisition. Child Development, 1963, 34, 433-442.

SUBJECT: Relationship of analytic conceptualization to concept acquisition involving analysis of figure and ground.

METHOD: Fourth-grade children were tested for analytic and relational conceptualizing style. They were then asked to associate over trials a nonsense label with geometric designs containing figure and ground elements. After learning to criterion, they were shown the figure and ground components separately and tested for association with the nonsense syllable label.

RESULTS: The analytic children were more accurate in correctly associating the label with the figural component presented alone.

Lockheed, M. E. Cognitive style effects on sex status in student work groups. Research Bulletin, Educational Testing Services, Princeton, New Jersey, 1976, RB 76-18.

SUBJECT: The purpose of this study was to determine if the greater activity, and task orientation of males in mixed-sex work groups (as observed in previous studies) would be systematically different according to different cognitive styles of the group members.

METHOD: Ninth, tenth, and eleventh grade high school students were classified as to cognitive style

(field-dependent, field-independent, indeterminant) and then placed into homogenous cognitive style groups of two males and two females each. The groups were videotaped as they engaged in a group decision-making task which was coded for individual rates of activity and influence. Group members also rated each other as to best ideas, most guidance and direction, and as to overall leadership.

RESULTS: The data indicated the field-dependent and the indeterminant groups displayed more male-dominated interactions, while the field-independent groups had equal sex status interactions. Males were also identified as being the leader more often regardless of the type of cognitive group.

Long, G.M. Field dependency-independency: A review of the literature. Pensacola, Florida: Naval Aerospace Medical Research Laboratory, Naval Aerospace Medical Institute. 1972.

SUBJECT: This paper represents an attempt at an extensive review of the perceptual style literature in terms of the field dependence-independence concept.

METHOD: This review included sections on the psychometric measure, Rod and Frame Test (RFT) and Embedded Figures Test (EFT) and their problems, relationships between the EFT and the RFT, the critical considerations, and use of the concept in practical research.

RESULTS: The author concludes that although the basis of perceptual differences is still in question the usefulness of the empirically derived relationships is still viable and much more investigation must be done.

Lowenfeld, V. Tests for visual and haptical aptitude. American Journal of Psychology, 1945, 58, 100-112.

SUBJECT: Definition of visual and haptic perceptual types and descriptions and explanations of tests to identify them in individuals. Also, results of studies in which these tests were administered to subjects.

METHOD: Five tests of visual-haptic aptitude were administered and their responses analyzed according to procedures discussed in the article. A total of 1128 responses were obtained from 224 subjects.

RESULTS: Judging from analysis of subjects' total scores on all five tests, 47% of the subjects were clearly visual, 23% were haptic, and 30% were indefinite.

Lowenfeld, V., & Brittain, W.L. Creative and Mental Growth (5th Edition). New York: MacMillan Company, 1970.

SUBJECT: This book contains discussions of the visual and haptic types and manifestations of perceptual type. Especially in various forms of artistic expression. Numerous examples are used to illustrate typical visual and haptic creations.

McKinney, J.D. Problem-solving strategies in reflective and impulsive children. Journal of Educational Psychology, 1975, 6, 807-820.

SUBJECT: The development of problem-solving strategies in reflective and impulsive children is described and an assessment of the generality of strategy behavior in the two style groups across a variety of problem-solving tasks was made.

METHOD: 173 children, 7-, 9- and 11-year-olds, were administered the Matching Familiar Figures Test and classified as impulsive (86) or reflective(87). The subjects were also administered the Wechsler Intelligence scale for children. The final sample was composed of 75 boys and 98 girls. The subjects were individually administered the Matrix Solution and Pattern Matching Tasks, and in a subsequent session 20-question tasks were given. A 2x2x3x4 mixed factorial design was used for analyses.

RESULTS: The data obtained in this study indicated that problem-solving strategies are affected by the impulsive or reflective cognitive style. Reflective subjects seemed to process task information more efficiently than impulsive subjects and used more mature strategies. Cognitive style had the most significant impact on the problem-solving behavior of the 7- and 11-year-olds. Reflectives were more apt to use a focusing approach in a variety of problem situations.

Messer, S. Reflection-impulsivity: Stability and school failure. Journal of Educational Psychology, 1970, 6, 487-490.

SUBJECT: The stability of the reflective-impulsive cognitive style was studied over a 2 1/2 year period. Also examined is the degree of reflection-impulsivity of a small subsample of children who failed a grade during the study period.

METHOD: 65 boys, administered the Matching Familiar Figures Test in grade 1, were retested 2 1/2 years later, in the spring term of grade 3. For the retest, a more difficult version of the MFF was administered.

RESULTS: There was a significant relationship ($p < .05$) between the distributions of reflective and impulsive

subjects for grades 1 and 3. Of the 65 boys tested, 7 had failed a grade and were in grade 2 at the time of the retest. There was a significant difference between the boys who failed and the other boys on latency and errors for grades 1 and 2 1/2 years later ($p < .01$); the failures were more impulsive both times. The correlations of latency and errors for 2 1/2 years were modest compared with up to one year. The drop in stability may be due to the cognitive style of the teacher (modeling effect) or anxiety aroused in the school situation.

Oltman, P.K., Ehrlichman, H., & Cow, P.W. Visual asymmetry in the perception of faces and field independence. Research Bulletin, Educational Testing Services, Princeton, New Jersey, 1976, RB-76-13.

SUBJECT: This was an investigation into the relationship of hemispheric lateralization and the cognitive dimension of field dependence-independence.

METHOD: Two separate experiments were performed in which college subjects were asked to select from two human faces the one that most resembled a third face. Actually, the two faces were composites, one of the right half of the third face and its mirror image, the other, the left half of the third face and its mirror image. Previous research had indicated that an observer's impression of what someone looks like is determined more by one side of the face than the other. This was an attempt to see if this preference was affected by the field dependent-independent dimension.

RESULTS: It was found that field-independent subjects showed a significantly stronger tendency to select the left-visual-field composite in their perceptions of faces than did the field dependent individuals, who are less differentiated psychologically, and also seem to be less differentiated in terms of extent of left-visual-field lateralization in the perception of faces.

Pohl, R.L., & Pervin, L.A. Academic performance as a function of task requirements and cognitive style. Psychological Reports, 1968, 22, 1017-1020.

SUBJECT: Relationship of level of integrative cognitive complexity to academic success in selected subjects

METHOD: Male college undergraduates in the fields of engineering, natural sciences, humanities, and social sciences were tested for their level of integrative cognitive complexity. Controlling for

SAT-verbal and SAT-math scores, their grades in their subject fields were correlated with their complexity scores.

RESULTS: Low-complexity students achieved higher grades in engineering, while high-complexity students achieved higher grades in humanities and social sciences. No relationship was found between cognitive complexity scores and grades in natural sciences.

Runkel, P.J., & Damrin, D.E. Effects of training and anxiety upon teachers' preference for information about students. Journal of Educational Psychology, 1961, 52, 254-261.

SUBJECT: Training effects on cognitive complexity in adults.

METHOD: Teacher trainees were tested at the beginning, middle, and end of their training concerning the variety and complexity of information they deemed important for teachers to know.

RESULTS: A curvalinear relationship was found between time spent in training and cognitive complexity. At the beginning of training, the trainees possessed a large number of constructs. These diminished to a small number in the middle of training, but rose to a large number again by the end of the training. Apparently the training, at its midpoint, was causing a focusing of attention on a few major constructs stressed in the training, but this focusing disappeared at the end of training, at which time the trainees could return to their original complex set of constructs.

Sack, S.A., & Rice, C.E. Selectivity, resistance to distraction and shifting as three attentional factors. Psychological Reports, 1974, 34, 1003-1012.

SUBJECT: This study attempted to analyze the act of attending, based upon the premise that attention can be analyzed into at least three processes: degree of selectivity, resistance to distraction, and shifting.

METHOD: Subjects were 164 eighth-grade students. Three tests considered to measure selectivity of attention were administered: the Group Embedded Figures Test, Closure Flexibility, and the Hidden Figures Test. To assess distraction, three tests from Karp's Kit of Selected Distraction Tests were used: the Arithmetic Operations Test, Distracting Contexts Test, Cancellation, and a group adaptation of the Stroop Color Word Test. To assess shifting, two tests were prepared: Anagrams,

in which the subject is to unscramble letters to form words; and reversed triangles, in which the subject draws a series of triangles and then has to rearrange them as instructed.

RESULTS: The procrustes method was used to determine if the obtained factor matrix conformed to the hypothesized matrix. Three factors emerged from the analysis, Identified as selectivity, resistance to distraction, and shifting. As anticipated, the selectivity factor was defined by the embedded figures tasks, with moderate loading by the Stroop test. Ability to resist distraction was defined by Karp's distraction tests and by triangles. The shifting factor was defined by the Stroop, cancellation, triangles, and anagrams. Tests loaded as predicted, except for the Stroop, which is often interpreted as requiring the ability to resist distraction.

Santostefano, S.G. Developmental study of the cognitive control "leveling-sharpening." Merrill-Palmer Quarterly, 1964, 10, 343-360.

SUBJECT: The development of the cognitive control leveling-sharpening in children is explored across three leveling-sharpening tests.

METHOD: Sixty children, ages six, nine, and twelve (twenty per group, ten boys and ten girls in each age group) were given three leveling-sharpening tests designed by Santostefano: The Wagon Test (elements subtracted); The Wagan Test (elements added); and the Circles Test, in which circles of ever-increasing diameter are sequentially displayed. In each task, the subject was required to detect changes in the display. A 2 x 3 factorial design was used, so that age, sex, and the interaction of age with sex were examined for significance as the main effects with an analysis of variance.

RESULTS: The data obtained in the study indicated that sharpening scores increase with age, with the greatest increases between ages nine and twelve. The leveling-sharpening Wagon Test, elements subtracted, was judged the most effective instrument for children. On that test, the difference among age groups was significant ($p < .01$), with boys exhibiting more sharpening than girls ($p < .01$).

Santostefano, S.G. Cognitive controls versus cognitive styles: Diagnosing and treating cognitive disabilities in children. Seminars in Psychiatry, 1969, 1, 291-317.

SUBJECT: This factor analytic study sought to determine the interrelationships of cognitive controls in terms of their developmental appearance in children.

METHOD: A battery of 29 cognitive tests were administered to a sample of children 6-, 9- and 12-year-olds. A factor analysis was performed.

RESULTS: Five factors emerged: Focal attention control; leveling-sharpening plus motor delay; motor delay control; leveling-sharpening control; and field articulation control. Cognitive control tests loaded on other factors in such a way that suggested to Santostefano a synthesis which he formulated in terms of a developmental model of cognitive control, in which focal attention predated field articulation developmentally; in turn field articulation predates leveling-sharpening.

Santostefano, S., & Paley, E. Development of cognitive controls in children. Child Development, 1964, 35, 939-949.

SUBJECT: This study attempts to ascertain if the two cognitive controls focusing-scanning and constricted-flexible, which have been identified in adult cognitive functioning, can also be isolated in the functioning of children and to explore whether these cognitive controls follow a developmental course.

METHOD: Sixty children randomly selected from a public school, composed of 6-, 9- and 12-year-olds, with ten boys and ten girls in each age group, matched approximately for intelligence as determined by the California Mental Maturaty Tests, were tested. Two tests designed by Santostefano were administered individually: The Circles Test, a measure of focusing-scanning; and the Fruit Distraction Test, a measure of the constricted-flexible control. A 2 x 3 factorial design was used for data analysis.

RESULTS: The 12-year-olds displayed significantly superior performance ($p < .01$) on the Circles test, but no significant differences were found with respect to sex or interaction of sex and age. Performance on the Fruit Distraction Test improved significantly with age ($p < .05$), but again no significant differences were found with respect to sex and the interaction of sex with age. The researchers concluded that these two cognitive controls do operate in children and follow a developmental course from scanning to focusing, and from constricted to flexible, with an increase with age.

Schroder, H.M., Driver, M.J., & Streufert, S. Human Information Processing. New York: Holt, Rinehart & Winston, 1967.
SUBJECT: This book discusses the conceptual-systems approach to cognitive complexity. It describes four systems or levels of cognitive functioning and a sentence-completion test to measure an individual's level of functioning.

Signell, K.A. Cognitive complexity in person perception and nation perception: A developmental approach. Journal of Personality, 1966, 34, 517-537.
SUBJECT: Cross-sectional study of developmental changes in cognitive complexity/simplicity.
METHOD: A sample of children from ages 9 to 16 were pretested for differentiation in cognitive complexity. Half the children were asked to judge familiar persons; the other half were asked to judge nations, Age differences in both kinds of judgements were evaluated in terms of number and variety of diminsions used in judgements and degree of articulation within the dimensions.
RESULTS: When familiar persons were judged, children showed increasing cognitive complexity with age through greater articulation of constructs already in their repertoire, rather than through the addition of cognitive complexity increases with age through the new constructs. However, when nations were judged, cognitive complexity increased with age through the acquisition of new constructs rather than through differentiation. The author concluded that a difference existed in the way children develop cognitive complexity with respect to "experimental" learning needed in their everyday life and "didactic" learning in the formal setting of classrooms of ideas not relevant to their daily social environment.

Watchel, P.L. Style and capacity in analytic functioning. Journal of Personality, 1968, 36, 202-212.
SUBJECT: Relationships between analytic-relational conceptualization and field independence-dependence.
METHOD: College students were given Kagan's Figure Sorting Task (FST) as a measure of analytic-relational conceptualizing style and Witkin's Embedded Figures Test (EFT) as a measure of field independence-dependence. The subjects were then required to recognize element, form, and background components of designs.

RESULTS: Subjects with extremely high scores on EFT did significantly better than those with extremely low scores in the identification of the components. Performance was not, however, related to performance on the FST, nor was FST related to EFT performance. The author combined his findings of relationship between learning of part-variations of designs to field independence but not to conceptualizing style for adults with contrasting findings by other researchers (see Lee, et al., 1963) of relationship between the same sort of learning task and conceptualizing style in children. He concluded that in adults, field independence measured analytic capacity, while conceptualizing style was a preference dimension; but in children, the conceptualizing style sorting task represented an analytic capacity measure much like field independence.

Walter, W.G. The Living Brain. New York: W.W. Norton & Company, 1963. Chapter 8, "Intimations of Personality," pp. 197-232.

SUBJECT: Brain alpha waves as a physiological basis for visual and non-visual (haptic) functioning.

METHOD: Previous research is reported documenting the tendency of individuals with persistent alpha rhythms to prefer auditory, kinesthetic, and tactile perception to visual imagery. Approximately 600 subjects were tested with an EEG for alpha wave activity with and without the presence of visual image stimuli. Alpha waves are typically prominent when the eyes are shut and the mind is at rest and disappear when the eyes are opened, when visual imagery is either seen or induced mentally, and when the subject makes a mental effort.

RESULTS: About 2/3 of the subjects were found to display responsive alpha activity. About 1/6 produced constant alpha, and another 1/6 produced no significant alpha at all. In light of the relationship reported between perceptual modality preference and alpha activity, it was concluded that those individuals with no significant alpha were habitually thinking in the visual imagery mode, while those with persistent alpha were not responsive to visual imagery.

Witkin, H.A. The perception of the upright. Scientific American, 1959, 200, 50-56.

SUBJECT: This article involves a complete description of the perceptual styles field-dependence-independence and describes the theoretical basis for this dimension.

METHOD: The discussion includes many important aspects of the perceptual styles such as ability to use visual vs. kinesthetic cues; personality factors such as motivation, emotion, and defenses; field-dependence as a continuum, changes over time, disembedding figures, analytical competence; early life experiences; etc.
RESULTS: The field dependence-independence dimension is seen as a very productive area for research and as a theoretical dimension that might prove very useful in understanding psychological and perceptual aspects of everyday interactions.

Witkin, H.A., Dyk, R.B., Faterson, H.F., Goodenough, D.R., & Karp, S.A. Psychological Differentiation: Studies of Development. New York: Wiley, 1962.
SUBJECT: This book gives a complete description of Witkin's theory of psychological differentiation.
METHOD: This book gives a complete description of the development of the psychological differentiation theory. Areas covered include description of the Rod and Frame Test, Embedded Figures Test, and other related tests. Also covered were the developmental aspects of the theory, relationship of differentiation to intelligence, Rorschach responses, memory, body concepts, separate identity, defense mechanisms, attitudes, pathology, mother-child relationships, etc.
RESULTS: This book gives reasoning behind the psychological differentiation theory and indicated that individuals who differ on cognitive style also differ as to how they satisfy needs, resolve conflicts, handle aggression, form attitudes, etc.

Witkin, H.A., Lesis, H.B., Hertzmann, M., Machover, K., Meissner, P. & Wapner, S. Personality Through Perception. New York: Harper, 1954.
SUBJECT: This book reviews the research done by Witkin and his associates dealing with the perceptual style area.
METHOD: The perceptual style research is covered in detail. Descriptions of testing procedures (Rod and Frame Test, Tilting Room, Tilting Chair Test, Revolving Room Test, Embedded Figures Test, Body Adjustment Test, etc.) were also given and their use in the research is described.
RESULTS: A synthesis of the research indicated that individuals perceive the upright either visually or kinesthetically (body position), with women more field dependent than men. It was concluded that the field independence-dependence dimension was a psychologically

related feature of an individual's makeup.

Witkin, H.A., Moore, C.A., Goodenough, D.R., & Cox, P.W. Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, 1977, 47, 1-64.

SUBJECT: This article reviewed the concepts and methods derived from work on cognitive styles (field dependence-independence in particular) over the past 25 years and related the findings of this research to problems in education.

METHOD: This article gives a thorough review of the developemnt of the articulate and global cognitive style dimension and the instruments used for its measurement. Detailed characterizations of the cognitive styles in perceptual and intellectual domains and in personality domains (social behavior, body concept, and defenses) were done. Also four areas of learning that have been explored with respect to cognitive style were discussed in detail. These areas included learning of social material, the effects of social reinforcement, mediating mechanisms in learning, and cue salience. Other important topics such as teacher and student cognitive styles and their interaction, and educational-vocational interest and choices in relation to cognitive styles were explored.

RESULTS: This article indicates that cognitive style characteristics are extremely important in education and must be studied in more detail in order to maximize educational opportunities for all.

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