Parental influence on children's cognitive style

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Parental influence on children's cognitive style

by

Ronald Alfred Oliver

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Major: Child Development

Approved:

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Introduction

The term cognitive style refers to a characteristic, self-consistent mode of functioning in perceptual and intellectual activities (Witkin, 1964). Witkin, Dyk, Faterson, Goodenough, and Karp (1962) have demonstrated that individuals tend to perform similarly on perceptual and intellectual activities having a common denominator of overcoming an embedded context. More specifically, in each of the perceptual and intellectual tasks, individuals are required to overcome the organization of the embedded field and to separate items from the contexts in which they are contained. In the area of cognitive style, the perceptual and intellectual components involve figure-ground relationships. Each individual, in order to overcome the influence of an embedded context, must be able to "break up" a field into its component parts and to differentiate an item or figure from its background.

Witkin et al. (1962) report research in which they demonstrate individual differences in ability to overcome the influence of an embedded context. According to Witkin and his colleagues (1962), individuals who possess an analytical field approach are able to overcome an embedded context and to experience items as being discrete from their backgrounds. On the other hand, individuals who possess a global field approach are unable to overcome an embedded context and experience items as being fused with their backgrounds. In general, the term field approach (cognitive style) represents a style of functioning in both the perceptual and intellectual behavior of an individual. In other words, analytical and global cognitive styles represent contrasting ways of approaching a field, whether the field
is immediately present (perception) or represented symbolically (thinking) (Witkin, Oltman, Raskin, & Karp, 1971).

Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) and Witkin, Dyk, Paterson, Goodenough, and Karp (1962) have shown that children the same age differ in their cognitive styles. A perusal of the literature revealed the effects of parental influence (mothers and fathers) to be a source in explaining individual differences among children's cognitive styles, although research in this area is limited.

It would appear appropriate, therefore, to investigate the area of parental influence on children's cognitive styles. Thus two major needs would be fulfilled: (1) to provide empirical data concerning the relationship between parents' and children's cognitive styles and (2) to determine whether or not cognitive styles between siblings and between their parents are similar. Such an investigation would contribute relevant knowledge to the field of child development and to the antecedents of children's cognitive styles. In addition, parents and educators would benefit from the information concerning the relationship of parents' and children's cognitive styles. Parents might learn whether they both have an influence on the development of their children's cognitive styles or whether their influence relates specifically to the child of the same-sex or opposite-sex. In teaching courses concerning parent-child relationships, educators utilizing information from this study could help children understand the influence parents have on the development of their cognitive styles.
General Theoretical Background

More than two decades ago Herman Witkin (Witkin, 1949, 1950) became interested in the field of perception and more specifically in the way people orient themselves in space. In order to experimentally study the individual's orientation in space, Witkin devised three orientation tests: Rod and Frame Test (RFT), Body Adjustment Test (BAT), and Rotating-Room Test (RRT). According to Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954), in each of these tests the subject may locate the true upright position, corresponding to the direction of the force of gravity, either according to the axes of the visual field or to sensations from his own body. Individuals, then, who determine the perceived vertical position (direction parallel with the force of gravity) almost completely with reference to the visual field are field-dependent. On the other hand, individuals who locate the perceived vertical position almost entirely on the basis of bodily position are field-independent. In each of the orientation tests, the subject is required to designate the upright position by adjusting an item (rod, body, or field) to a location he perceives as vertical.

Witkin et al. (1954) have demonstrated that individuals differed from one another in perceiving a vertical position corresponding to the direction of the force of gravity. They showed that subjects differed in their relative dependence on the visual field and in their relative ability to utilize bodily experiences in overcoming the influence of the field. One major characteristic of perception demonstrated by performance in the three orientation tests is the ability to perceive a part of a field independently of its surroundings, or to deal with a given field analytically. Therefore, in the RFT, a correct determination of the position of the rod
requires that the subject dissociate the rod from the tilted frame that surrounds it. Similarly, in the BAT the subject must avoid being influenced by the tilting room if he is to succeed in maintaining his body upright.

In order to determine if the ability to "break up" a field is a general characteristic of an individual's perception, Witkin (1950) found it necessary to develop another test to evaluate this ability under different circumstances. He devised the Embedded Figures Test (EFT) which does not in any way involve perceiving a vertical position, corresponding to the direction of the force of gravity, while requiring the subject to extract an item from its context. The speed with which the subject discovers the simple figure in the more complex figure measures the subject's ability to remain uninfluenced by the context in which the item is presented. High correlations are reported between scores on the orientation tests (BAT and RFT) and scores on the EFT: BAT .74 (p<.01), RFT .86 (p<.01) (Witkin et al., 1962). Therefore, a tendency for perception of part of a field to be perceived as discrete from the organized field is a pervasive characteristic of a given individual's perception and is not related just to the specific space orientation tests (Witkin & Oltman, 1967).

Witkin, Dyk, Faterson, Goodenough, and Karp (1962) stated the field-dependence-independence dimension is not limited to perceptual organization, where the individual must deal with a stimulus configuration that is immediately present. The field-dependence-independence dimension also is manifested in intellectual functioning, where the individual deals with symbolic representation. The field-dependence-independence dimension first observed in perception and hence having a very specific perceptual connota-
tion was too limited a label for the broader cognitive style. But once it was shown that this same dimension also was found in the intellectual sphere, the field-dependence-independence dimension was designated as a cognitive style (Witkin, Oltman, Raskin, & Karp, 1971).

According to Witkin (1964), the term cognitive style refers to a characteristic, self-consistent way of functioning in perceptual and intellectual activities. More specifically, a cognitive style is either analytical or global in character and is representative of an individual's mode of functioning in problem-solving situations. A cognitive style (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962) is based on a global-analytical continuum and is composed of a perceptual component (field-independence-analytical and field-dependence-global) as well as an intellectual component (analytical-global).

Witkin et al. (1962) distinguishes between individuals with an analytical and a global cognitive style. Perceptually, a field-independent individual tends to experience his surroundings analytically, by isolating objects from their background. A field-dependent individual tends to experience his surroundings in a relatively global fashion, passively conforming to the influence of the prevailing context. In other words, in a field-independent mode of perceiving, parts of the figure are perceived as discrete from their backgrounds. In a field-dependent mode of perceiving, perception is dominated by the overall organization of the surrounding field, and parts of the field are perceived as being fused together. Therefore, the field-independent individual is much more successful in overcoming an embedded context than the field-dependent person. Intellectually, an analytical person rather than a global person tends to perform
better on intellectual tasks which are analytical in form and require the separation of essential elements from their surrounding contexts.

In summary, then, individuals with an analytical cognitive style possess a field-independent mode of perceiving as well as an analytical intellectual mode of functioning. Individuals with a global cognitive style possess a field-dependent mode of perceiving as well as a global intellectual mode of functioning (Witkin et al., 1962).

Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) and Witkin, Dyk, Paterson, Goodenough, and Karp (1962) demonstrated that children the same age differ in their cognitive styles. Recently there have been attempts to discover the origin of these individual differences. In an attempt to explain the origin of individual differences in cognitive styles of children, Witkin et al. (1962) have investigated whether or not there is a similarity between children and parents in cognitive styles. The work of Witkin and his colleagues hitherto has been concentrated on the mother-son relationship partly because of the accessibility of mothers for research.

The hypothesis tested stated mothers who are more differentiated (more analytical) have children who also are differentiated. To test the hypothesis, 68 10-year-old children were given a series of perceptual tests (BAT, RFT, EFT) and the Wechsler Intelligence Scale for Children. All mothers were given an extensive interview; in addition, one group of mothers was given the EFT and a Human Figure Drawing Test to determine whether or not interactions with their children foster or inhibit differentiation. The interview included physical care, a child's past and current adaptations to
school, discipline, the mother's attitude toward her child, and information about family members.

Witkin et al. (1962) summarized each interview and arrived at a global impression as to whether each mother was fostering or inhibiting differentiation in her son. The results indicated the relationship between the extent of differentiation of mother and child tended to be significant when the mother's interview rating and figure drawing score were used to reflect differentiation but was not significant when the mother's EFT score was used to reflect differentiation. In a somewhat similar context concerning field articulation of enuretic and nonenuretic boys and their mothers, Scallon and Herron (1969) found mothers of enuretic and nonenuretic boys had significantly different perceptual styles when compared to their sons.

Since the relationship has been reported that the mother's EFT scores and her son's perceptual and intellectual indices were not significant, other family members may be important in the development of perceptual and intellectual differentiation. The father's contribution in cognitive style research is a viable area for investigation (Witkin et al., 1962; Witkin, 1965, 1969). Heretofore, a limited amount of research has been conducted using fathers as subjects.

A perusal of the literature revealed two studies utilizing fathers as subjects, and both of these investigations were concerned with perceptual styles. In both of these studies, family constellations consisting of mothers, fathers, and sons were compared to family constellations consisting of mothers, fathers, and daughters. The results were contradictory. Corah (1965) found the level of perceptual differentiation in boys was significantly related to their mothers but not to their fathers, while the
level of perceptual differentiation in girls was significantly related to their fathers but not to their mothers. In another study, it was demonstrated that son's EFT scores were related to their fathers' EFT scores, and daughters' EFT scores were related to their mothers' EFT scores. In other words, perceptual differentiation among parents and their children was found to be related more to the same-sex parent than to the opposite-sex parent (Schaffer, 1969).

The empirical investigations involving parental influence on perceptual styles of children (Corah, 1965; Schaffer, 1969) have shown equivocal findings. These research studies attempted to determine whether or not there existed parent-child similarities concerning perceptual styles. The perceptual dimension investigated in the previous studies is a component of the broader area of cognitive style. A cognitive style incorporates both the perceptual and intellectual spheres, and according to Witkin (1964), a cognitive style is a self-consistent mode of functioning that individuals show in perceptual and intellectual activities.

Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) and Witkin, Dyk, Faterson, Goodenough, and Karp (1962) have shown that children the same age differ in their cognitive styles. The effects of parental influence as a source in explaining individual differences among children's cognitive styles is an area in need of empirical investigation (Witkin et al., 1962; Witkin, 1965, 1969).

**Specific Theoretical Background**

Although Witkin was never a student of Werner, he was obviously influenced by his work. In fact, the research conducted by Witkin and his col-
leagues fits neatly into Heinz Werner's Organismic Developmental Theory. Werner's theory (Werner, 1957) is based on the orthogenetic principle of development which states that "wherever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation and hierarchic integration" (p. 126). The concept of differentiation provides the connection between Witkin's work and Werner's theory.

Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) and Witkin, Dyk, Faterson, Goodenough, and Karp (1962) postulated two perceptual styles, field-independent and field-dependent. In contrasting the two perceptual styles, the investigators stated the field-independent mode of perceiving was more analytical, more articulated, and more differentiated than the field-dependent mode of perceiving. Witkin (1960) also stated that an analytical cognitive style, in contrast to a global cognitive style, tended to be an indicator of a high level of differentiation in the cognitive area.

According to Werner (1948), a state involving nondifferentiation between a subject and an object occurs earlier developmentally than one where there is differentiation of a subject and an object. The preceding statement of increasing subject-object differentiation reflects that as an individual develops, his perception becomes less dominated by the concrete situation and hence less stimulus-bound. Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) concur that an individual's perception increases developmentally. The investigators stated very young children's perception involves an emphasis on global, undifferentiated impressions, while older children's perception is more analytical and more dif-
ferentiated. To supplement the preceding information, data from longitudinal studies involving children and young adults in two groups (ages 8 to 13 years and 10 to 24 years) revealed decreasing field-dependence to age 17 with no further change from 17 to 24 years (Witkin, Goodenough, & Karp, 1967).

Werner (1957) stated the formation of percepts included an orderly sequence of stages. Perception is first global with whole-qualities being dominant. The next stage is analytic with perception being selectively directed toward parts. The final stage is synthetic with parts becoming integrated with respect to the Gestalt. Perception may be considered articulated or analytical in contrast to global, if the person is able to perceive items as discrete from their background when the field is structured and to impose structure on a visual field when the field has relatively little inherent structure (Witkin, 1969). Individuals, then, who experience their environment analytically have the ability to analyze and structure experience; both of these abilities are aspects of increasing articulation or differentiation (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962).

Perception (Langer, 1969; Witkin, Dyk, Faterson, Goodenough, & Karp, 1962) is a stage in cognitive development, and the development of perceptual activity continues until adulthood as a parallel system of action that is a hierarchically integrated part of the person's cognitive organization. A characteristic of hierarchic organization is the dominance of higher level functions over lower level functions (Werner, 1957). Higher level functions are articulate and discrete whereas lower level functions are diffuse and syncretic. Cognitive activity in a diffuse and syncretic
organization is less clearly differentiated and more under the influence of qualities-of-the-whole than cognitive activity in an articulate and discrete organization. The development of perception and cognition, then, is characterized by a diffuse organization delineated by qualities-of-the-whole in the lower level functions, proceeding into an analytic organization characterized by integration of parts in the higher level functions (Werner, 1948).

**Statement of the Problem**

The purpose of the current investigation is to determine whether or not a significant relationship exists between the cognitive styles of parents and their children. A second objective is to determine whether or not (a) the cognitive styles between siblings are similar and (b) the cognitive styles between their parents are similar.

Operational definitions for the study are:

**Cognitive Style** The term cognitive style refers to a characteristic, self-consistent way of functioning in perceptual and intellectual activities (Witkin, 1964). The perceptual dimension (field-dependence-independence) will be measured by the Embedded Figures Test (Witkin, Oltman, Raskin, & Karp, 1971). The intellectual dimension (analytical-global) will be measured by the combined scaled scores of the Picture Completion, Block Design, and Object Assembly subtests of both the Wechsler Intelligence Scale for Children (Wechsler, 1949) and the Wechsler Adult Intelligence Scale (Wechsler, 1955).

**Children** Brothers and sisters between the ages of 11 years 0 months through 15 years 11 months who are not more than 2 years 3 months apart in age.

**Parents** Natural mothers and fathers who are not more than 50 years of age.

**Social Class** Determined by the Hollingshead and Redlich's Two Factor Index of Social Position (Hollingshead & Redlich, 1958).
The specific null hypotheses to be tested are:

1. There is no significant relationship between fathers and/or mothers and their sons in the perceptual dimension (field-independence-dependence) of cognitive style.

2. There is no significant relationship between fathers and/or mothers and their sons in the intellectual dimension (analytical-global) of cognitive style.

3. There is no significant relationship between fathers and/or mothers and their daughters in the perceptual dimension (field-independence-dependence) of cognitive style.

4. There is no significant relationship between fathers and/or mothers and their daughters in the intellectual dimension (analytical-global) of cognitive style.

5. There is no significant relationship between brothers and sisters in the perceptual dimension (field-independence-dependence) of cognitive style.

6. There is no significant relationship between brothers and sisters in the intellectual dimension (analytical-global) of cognitive style.

7. There is no significant relationship between fathers and mothers in the perceptual dimension (field-independence-dependence) of cognitive style.

8. There is no significant relationship between fathers and mothers in the intellectual dimension (analytical-global) of cognitive style.
Review of Literature

The purpose for the review of literature is to provide some background information for the present research investigation. The review will incorporate four areas involving perceptual and intellectual differentiation: (1) perceptual and (2) intellectual components of cognitive style, (3) sex differences, and (4) antecedents of cognitive style.

Cognitive Style

Many investigators (Witkin, Lewis, Hertzman, Machover, Meissner, & Wapner, 1954; Witkin, Dyk, Faterson, Goodenough, & Karp, 1962; Gardener, Holzman, Klein, Linton, & Spence, 1959; Gardener, Jackson, & Messick, 1961; Kagan, Moss, & Sigel, 1963) in recent years have turned their attention to the field of perception and more specifically to the problem of determining the consistency and generality of cognitive and personality characteristics in perceptual development. These three investigators (Witkin, Gardener, & Kagan) have studied different aspects of the same problem. Kagan et al. (1963) conducted research projects to determine individual differences in perceptual-cognitive categorizations; Gardener et al. (1959, 1961) investigated organizational tendencies (cognitive controls) that mediate an individual's perceptual, cognitive, and personality functioning, and Witkin et al. (1954, 1962) empirically studied and determined individual differences in perceptual, intellectual, and personality functioning (field-dependence-independence dimension). While all three areas are of concern, the work of Herman Witkin and his colleagues involving cognitive style is most relevant to the problem at hand. According to Witkin (1964), the term cognitive style refers to a characteristic, self-
consistent way of functioning in perceptual and intellectual activities. A cognitive style is either analytical or global in character, and the dimensions of each form may be described as follows:

At one extreme of the cognitive style continuum there is a consistent tendency for experience to be global and diffuse; the organization of the field as a whole dictates the manner in which its parts are experienced. At the other extreme there is a tendency for experience to be delineated and structured; parts of a field are experienced as discrete and the field as a whole organized (Witkin, 1965, p. 319).

Perceptual Component

The perceptual component of cognitive style is based on a field-dependent-independent continuum (Witkin, 1964). These two modes of perceiving have been delineated on the basis of whether or not individuals could find embedded simple figures in perceptually obscured complex figures. In a field-dependent mode of perceiving, perception is dominated by the overall organization of the surrounding field, and parts are experienced as being fused together. A field-dependent person has difficulty analyzing or "breaking up" a field into its component parts and reorganizing and imposing structure on an unorganized field. In a field-independent mode of perceiving, parts are experienced as discrete from their background, and the field as a whole is experienced as organized. Therefore, a field-independent person is able to analyze component parts and reorganize and impose structure on a field when there is relatively little structure. The abilities, then, to both analyze and structure a field are characteristics of perceptual differentiation (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962).
In order to determine whether or not developmental changes occur in
cognitive style, Witkin, Goodenough, and Karp (1967) conducted a study con­
cerning the stability of cognitive style from childhood to young adulthood.
Longitudinal and cross-sectional data were obtained for two groups of boys
and girls ages 8 to 13 years and 10 to 24 years. There were 30 boys and 30
girls studied longitudinally and approximately 175 boys and 175 girls
studied cross-sectionally. Each subject was administered three tests of
perceptual dependence: Rod and Frame Test (RFT), Body Adjustment Test
(BAT), and Embedded Figures Test (EFT).

An analysis of variance for both longitudinal (RFT, $F = 33.93, df =
2/98, p<.01$) and cross-sectional (EFT, $F = 44.99, df = 6/439, p<.01$) groups
showed a progressive decrease in field-dependence to age 17. From age 17
to 24, the longitudinal data showed no further change, but the cross-sec­tion­
tional data showed an increase in field-dependence. Witkin, however,
stated the increase in field-dependence after age 17 was due to a sampling
artifact. Comalli (1967) found at some point between 24 years and old age
(approximately 84 years) the process of dedifferentiation or a return to
field-dependence begins. He suggested this point may be in the late 30's,
on the average, but he concluded the result was tentative because of the
limited number of subjects studied.

Another investigation to explore changes in field-dependency through
adulthood and old age was conducted using three groups of subjects: a 17-
year-old group, and 30- to 39-year-old group and a 58- to 80-year-old
group. There were 23 boys and 23 girls in the 17-year-old group, 20 men
and 20 women in the 30- to 39-year-old group, and 17 men and 17 women in
the 58- to 80-year-old group. Each subject was administered the RFT, BAT,
and EFT, as measures of field-dependence. An analysis of variance revealed significant age changes in field-dependence for both men and women (BAT, $F = 3.17, p<.05$; RFT, $F = 4.99, p<.01$; EFT, $F = 3.15, p<.05$) on all three measures of field-dependency. For both men and women, increasing age was accompanied by increasing field-dependence with the geriatric group (58 to 80 years) being the most field-dependent (Schwartz & Karp, 1967).

In an attempt to determine dimensions of analytic attitude in cognition and personality, Messick and Fritzky (1963) administered a design variation task and a group EFT to 88 male undergraduates. Each subject was instructed to learn the association of nonsense syllables to each of 10 geometric designs in a seven-minute time period. Each design consisted of a large dominant figure composed of discrete elements against a patterned background. Once the designs were learned, 11 variations (discrete elements) of the 10 designs were presented for identification. Scores for the 11 types of design variations and the group EFT were factor analyzed. Two major dimensions represented two relatively independent modes of stimulus analysis, one emphasizing the articulation of discrete elements and the other emphasizing figural forms. A significant relationship ($r = .29, p<.01$) was obtained between the element articulation dimension and the subjects' EFT performance, thereby linking the element articulation factor to field-independence.

A somewhat similar study was conducted to investigate style and capacity in analytic functioning. Male students from introductory psychology classes at Brooklyn college were administered a group EFT and human figure drawings which were drawn by each subject and rated according to the sophistication-of-body-concept scale (Witkin, Dyk, Faterson, Goodenough, &
Karp, 1962). The human figure drawings were rated from 1 to 5 with one being the lowest score and five the highest score based on the production of the drawings. Subjects were selected as extremely field-independent (n = 21) by scoring in the top third of EFT scores and obtaining scores of 4 or 5 on their human figure drawings. Field-dependent subjects (n = 23) scored in the bottom third of EFT scores and obtained scores of 1 and 2 on their human figure drawings. All subjects then were administered a sorting task and a design variation task used by Messick and Fritzky (1963) described in the preceding study. In the sorting task, each subject was shown an array of human figures and asked to select groups of two or more figures on the basis of four types of categories: (1) Descriptive-global, (2) Descriptive-part-whole, (3) Categorical-inferential, and (4) Relational-contextual. The same array of human figures was shown 10 times to each subject providing 10 different groupings.

The author found a significant relationship (t = 4.05, p < .001) between field-independence and identification of discrete elements of previously learned designs; both failed to reach significance with styles of categorizing on the sorting task. The author also reported field-dependent and field-independent subjects did not differ in learning the complete designs (t = 1.31, p > .05) but did in learning the discrete elements of the designs (t = 4.89, p < .001). In conclusion, successful performance on the EFT and identification of the discrete elements of the design variation task were seen as reflecting primarily an analytic capacity, whereas the production of analytic categories (Descriptive-part-whole) on the sorting task was seen as reflecting primarily a stylistic preference (Watchel, 1968).
Intellectual Component

Witkin, Dyk, Faterson, Goodenough, and Karp (1962) stated the field-dependence-independence dimension is not limited to perceptual organization where the individual must deal with a stimulus configuration that is immediately present but also is manifested in intellectual functioning where the individual deals with symbolic representation. The authors also stated the relationship between perceptual and intellectual functioning have in common the requirement of separating an item from an embedded surrounding. Therefore, the performance of subjects on the EFT is related to intellectual tasks requiring the capacity of overcoming embeddedness.

Cohen (1957, 1959) conducted two investigations concerning the factorial structure of the Wechsler Adult Intelligence Scale (WAIS) and the Wechsler Intelligence Scale for Children (WISC). The four groups involved with the WAIS were differentiated by age: 18-19 (n = 200), 25-34 (n = 300), 45-54 (n = 300), and 60-over-75 (n = 352) years. The first three groups were part of the regular standardization sample while the 60-over-75-years age group was a supplementary standardization group obtained in the Kansas City area. The three age groups involved with the WISC were differentiated by age: 7 years, 6 months (n = 200), 10 years, 6 months (n = 200), and 13 years, 6 months (n = 200). All three of these age groups also were part of the regular standardization sample. Cohen found three main factors present in both the WAIS and WISC. The first of these factors represented by the Information, Comprehension, and Vocabulary subtests was labeled Verbal-Comprehension. The second factor represented by the Arithmetic, Digit Span, and Digit Symbol subtests was labeled Attention-Concentration. The
third factor labeled Analytical or Perceptual Organization was represented by the Picture Completion, Block Design, and Object Assembly subtests. Research reported in Witkin, Dyk, Faterson, Goodenough, and Karp (1962) showed that performance on the Picture Completion, Block Design, and Object Assembly subtests, as well as on the EFT, have the common task requirement of separating or isolating an item from an organized configuration. In the Picture Completion subtest, the subject is shown a meaningful picture with an important part missing. If the missing element is to be found, the subject cannot limit himself to an overview of the well-organized picture; he must give his attention successively to one part at a time. In the Block Design subtest, the subject is given a reference design which he is asked to reproduce by the appropriate arrangement of blocks. The reference design has an organization which must be "broken up" into component blocks if it is to be reproduced. In the Object Assembly subtest, the subject is given parts of a meaningful object and asked to assemble the parts. The "natural" organization of the known or imagined whole object must be overcome if the subject is going to assemble the parts correctly.

Goodenough and Karp (1961) and Karp (1963) in factor-analytic studies reported the EFT loaded on the same Analytical factor as the Picture Completion, Block Design, and Object Assembly subtests but not on the Verbal-Comprehension or Attention-Concentration factors. They hypothesized that a separate IQ computed for each of the three main factors with EFT performance scores would correlate at a significant level with the Analytical fac-
tor IQ's and would not correlate at a significant level with both the Verbal-Comprehension and Attention-Concentration factor IQ's.

A correlational study involving the perceptual index to the three factor scores by combining scaled scores for the WISC subtests was conducted using a 10-year-old group of subjects. The results revealed the perceptual index (EFT, RFT, BAT) and the Analytical (intellectual) index (Picture Completion, Block Design, Object Assembly) correlated .66 ($r = .66, p<.01$); the perceptual index and the Verbal-Comprehension index (Information, Comprehension, Vocabulary) correlated .26 ($r = .26$, not significant); the perceptual index and the Attention-Concentration index (Arithmetic, Digit Span, Coding) correlated .18 ($r = .18$, not significant). The relation between the extent of field-dependence and Full Scale IQ is designated specifically by portions of intelligence tests which, like the perceptual tests themselves, involve the capacity for analytical functioning. In summary, then, the relationship in performance of perceptual and intellectual tasks which have the common requirement of overcoming embeddedness provides specific evidence of a general cognitive style (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962).

Zigler (1963a, 1963b) challenged Witkin's et al. (1962) contention that field-dependence measures were related specifically to the Analytical index and not to general intelligence. Zigler pointed out by quoting Cohen (1959) that in 10-year-old children the three subtests comprising Witkin's intellectual index (PC, BD, OA) had correlations with G (general intelligence factor) of .42, .58, and .43, while the three subtests of the verbal index (I, C, V) correlated with G .86, .79, and .74. According to Cohen's
findings, both of Witkin's indices were significantly loaded on G. The verbal index, however, correlated higher than the intellectual index.

Although the G intelligence factor may have some influence on analytical functioning, there also is evidence of analytical functioning not being as independent of verbal skills as Witkin and his colleagues have claimed. Crandall and Sinkeldam (1964) obtained significant correlations ($r = .70, .40, .49, p < .05$ and beyond) in 12-year-old children among field-independence and the three WISC subtests (I, C, V) loading the Verbal-Comprehension factor. Wechsler (1949) also has shown that the Block Design subtest, which is the most closely related subtest to analytical functioning, correlated between .33 and .54 with the Vocabulary subtest in normative data on the WISC.

Kagan and Kogan (1970) summarized the issue by stating:

Although a case can be made against the partialling out of the G factor on the grounds that some of its components are determined by the analytic dimension (and Witkin has tried to make such a case), no such argument can be applied where verbal skills are at issue. The Witkin group has rejected the possibility of any theoretical bridge between analytic functioning and the WISC verbal cluster. Since field independence is sometimes empirically linked to verbal IQ, however, the control of verbal IQ becomes imperative when field independence is related to other variables (p. 1327).

In an attempt to determine the relationship between measures of psychological differentiation and intellectual ability, 143 female undergraduate students at the State University of New York were given the EFT and the RFT (Dubois & Cohen, 1970). The subjects also were given the State University Admissions Examination prior to admission. The SUAE gives two aptitude scores (Verbal and Quantitative) and five achievement scores (English, Social Studies, Art and Music, and Science and Mathematics). The authors
found all the correlations between the EFT and aptitude and achievement scores to be statistically significant (p<.01) while all but two correlations (English -.13 and Art and Music -.12) between the RFT and SUAE scores were statistically significant (p<.01).

The authors found significant relationships between field-dependent measures and intellectual activities having no relationships to embedding contexts. Because of their finding, Dubois and Cohen questioned Witkin and his colleagues' contention that significant relationships between field-dependent measures and intellectual tasks require the overcoming of an embedded context. Jackson (1957) also showed the correlation between the EFT and the American Council on Education Psychological Examination (ACE) scores were -.53 (p<.001) for 25 female and 18 male undergraduates. Subjects requiring longer times to extract embedded figures tended to have lower ACE scores. For males the correlation was -.57 (p<.001) and for females -.48 (p<.001).

Bigelow (1971) using 160 boys and girls between the ages of 5 and 10 years stated there was no significant relationship between the field-dependence-independence dimension measured by the Children's Embedded Figures Test and verbal intelligence measured by the Peabody Picture Vocabulary Test (PPVT) for three of four age groups. All of the children were grouped according to age, sex, intelligence, and socioeconomic status. The author also stated when age was not a factor, cognitive style and verbal intelligence were less likely to be related.

Another study in support of Witkin et al. (1962) was conducted concerning field-independence and concept formation. The subjects were 30 men, ages 18 to 24, and 26 women, ages 18 to 27, who were given the EFT,
the Abstraction test (SHA), of the Shipley Hartford Scale, and the Shipley Hartford Vocabulary test (SHV) (Shipley, 1940). The SHA test was given to measure perceptual concept formation. On this 20-item test (SHA), each item included several exemplars of a relation and then an incomplete exemplar which was to be completed by the subject. The following item is an example: AB, BC, CD, D__. The SHV consisted of 40 multiple-choice items from which the subject had to choose the word most similar to a clue word. The following item is an example: Talk; draw, eat, speak, sleep. The combined SHA and SHV scores were used to arrive at estimated IQ equivalents (SHIQ).

Men and women were divided into field-dependent and field-independent groups on the basis of a median split of their EFT scores. After this division, field-dependent and field-independent subjects were compared with respect to their mean scores on the SHA, SHV, and SHIQ. The results demonstrated field-independent men (t = 2.15, p<.05) and women (t = 2.26, p<.05) scored significantly higher than field-dependent men and women on the SHA. However, field-independent men (t = .29, p>.05) and women (t = 1.57, p>.05) did not score significantly higher than field-dependent men and women on the SHV. The authors also found male (t = 4.38, p<.05) and female (t = 2.79, p<.05) field-independent subjects obtained significantly higher SHIQ's than field-dependent subjects. The authors concluded, however, that significantly higher SHIQ scores obtained by field-independent subjects were attributable primarily to their higher SHA scores (Elkind, Koegler, & Go, 1963).

In summary, then, the literature revealed equivocal findings concerning the relationship of field-dependent measures and verbal intelligence as
well as the necessity for controlling verbal intelligence in cognitive style research.

**Sex Differences**

The literature is replete with many investigations revealing significant and nonsignificant sex differences in relation to field-dependent measures. In this section, a developmental approach will be employed to describe the research findings concerning sex differences on the EFT throughout the life span.

Goodenough and Eagle (1963), using a modification of the EFT more appropriate for young children, found no significant sex differences \((p>.05)\) in field-dependence for 48 boys and 48 girls in the 5- to 8-year-age range. Crudden (1941) and Karp and Konstadt (1963) utilizing perceptual tests similar to the EFT also found no significant sex differences \((p>.05)\) in field-dependence in the 5- to 8-year-age range. Bigelow (1971) employing children \((n = 160)\) in the 5- to 10-year-age range and Corah (1965) using children \((n = 60)\) in the 8- to 11-year-age range demonstrated no significant differences \((F = .009, df = 1, p>.05, p>.05, \text{ respectively})\) between boys' and girls' scores on the Children's Embedded Figures Test. Schaffer (1969) utilizing the EFT and boys and girls \((n = 80)\) in the 10- to 12-year-age range showed significant sex differences \((p<.05)\), with boys being more field-independent than girls on the EFT.

In a study reported earlier, Witkin, Goodenough, and Karp (1967) conducted longitudinal and cross-sectional investigations concerning the development of field-dependence through the 8- to 24-year-age range. Cross-sectional data on the EFT revealed a significant sex difference
(F = 13.47, df = 1/439, p<.01) for approximately 175 males and 175 females between the 10- to 24-year-age range with males being more field-independent. Longitudinal data for the 10- to 24-year group of subjects (n = 60) were not available because of the previously demonstrated practice effect on the EFT (Witkin, Lewis, Hertzman, Machover, Meissner, & Wapner, 1954; Goldstein & Chance, 1965).

Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) in their developmental studies with groups of subjects at ages 10 (n = 60), 13 (n = 50), 15 (n = 50), 17 (n = 48), and college adults (n = 102, mean age = 20 years) found males performed better on the EFT than females at all ages. The authors also reported trends for sex differences were found in subjects as young as 10 years of age, but significant sex differences were found only in the 17-year-old (p<.05) and college adult groups (p<.01). Witkin (1950), Newbigging (1954), and Bieri, Bradburn, and Galinsky (1958) using college subjects also demonstrated males were significantly more field-independent than females on the EFT.

In a study concerning field-dependence in 46 young adults (17-years-old), 40 middle-age adults (30 to 39-years-old), and 34 older adults (58 to 80-years-old), Schwartz and Karp (1967) showed men were significantly more field-independent than women on the EFT for the 17-year-old (F = 5.53, df = 1/44, p<.05) and 30- to 39-year-old (F = 8.43, df = 1/38, p<.05) groups but not for the 58- to 80-year-old group. Therefore, significant sex differences were found in the two younger groups but not in the older group.

In summary, developmental studies demonstrated sex differences on the EFT did not exist in children below the 10-year-age level or in geriatric groups. However, in general, sex differences on the EFT were apparent dur-
ing adolescence, young adulthood and middle age, with males being more field-independent than females.

According to Witkin, Dyk, Faterson, Goodenough, and Karp (1962), sex differences occurring in the perceptual area also were expected in the intellectual area. However, the authors stated data from standard intelligence tests were of limited use in determining sex differences because, in the construction of intelligence tests, items consistently favoring one sex were often excluded. Norman (1953), Miele (1958), and Gainer (1962) conducted investigations concerning sex differences on the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Adult Intelligence Scale (WAIS). The results demonstrated no sex differences in Full Scale IQ for both children and adults. On the Picture Completion, Block Design, and Object Assembly subtests of the WISC and WAIS, Gainer (1962) utilizing 200 children and Norman (1953) employing 153 adults reported no significant sex differences (p>.05), while Miele (1958), using 2,200 children and 1,700 adults between the ages of 5 and 64 years, found males scored significantly higher than females on both the Picture Completion and Block Design subtest but not on the Object Assembly subtest.

Because of the problems inherent in the construction of intelligence tests with respect to sex differences and the apparent equivocal findings previously mentioned, many researchers have attempted to demonstrate sex differences in other intellectual tasks which also required the overcoming of an embedded context. Some of these researchers are: Guetzkow, 1951; Nakamura, 1958; Sweeney, 1962; Cunningham, 1965; and Luchins and Luchins, 1959.
A study involving sex differences in the operation of set in problem-solving behavior (Guetzkow, 1951) was performed with 276 college students. The problem situations included the Gottschaldt Figures Test (Thurstone, 1944), the Hidden Pictures Test (Kreis, 1940), both similar to the EFT, and a volume measuring series. In both the Gottschaldt Figures Test and the Hidden Pictures Test the subject was required to find figures and pictures embedded in more complex backgrounds. In the volume measuring series, the subject was given three containers of different volumes and asked to obtain a volume of water which was different from the volume of the three original containers.

The volume measurement series consisted of eight problems. The first five problems in the series were solvable by a complex, indirect method. The two succeeding problems were ambiguous in that they could be solved by either the complex, set-induced method or another simple, more direct method. The number of complex solutions used on these two problems were a measure of susceptibility to set. A final problem, which would be solved only by the simple method, was given to measure each subject's ability to overcome set.

The results showed no significant difference (p>.05) between men and women in being susceptible to the establishment of set. However, a Chi square analysis ($X^2 = 5.4$, df = 1, $p<.02$) revealed men were better able to surmount the effects of set than women. A final result demonstrated that, regardless of sex, the group of subjects overcoming the effects of set performed better on the Gottschaldt Figures Test ($t = 3.2$, df = 70, $p<.01$) and on the Hidden Pictures Test ($t = 3.2$, df = 69, $p<.01$).
Another investigation (Nakamura, 1958) concerning problem-solving and sex differences was conducted using men (n = 64) and women (n = 77) undergraduates. The problem-solving measures consisted of 20 problems. Ten were straightforward problems and could be solved by direct methods. The other 10 were restructuring problems in which for most subjects the initial set or perception of the problem was inappropriate and a change in set or restructuring was required before the solution could be attained. The straightforward and restructuring problems were arranged to be administered alternately and in order of difficulty. A working time of four minutes per problem was allowed, and the problems were scored either correct or incorrect, with a correct answer receiving one point credit. Differences between mean differences revealed men were significantly better than women in solving both the straightforward problems (D = 1.29, p<.001) and restructuring problems (D = 1.54, p<.001).

Sweeney (1962) hypothesized men to be more effective than women in solving problems which require restructuring. Using a variety of problems (water-jar problems, arithmetic reasoning, and verbal reasoning problems), he was able to confirm this hypothesis, even when the groups of college men and college women compared had been matched with respect to general intelligence. Sex differences in performance on similar problems which did not require the overcoming of embedded contexts were generally not significant (p>.05). Cunningham (1965) and Luchins and Luchins (1959) employing elementary school children found similar results.

In summary, sex differences in the literature were not found in IQ scores on intelligence tests, and equivocal findings were demonstrated on specific analytical subtests on the WISC and WAIS for both children and
adults. However, other intellectual tasks also requiring overcoming set, restructuring problems, and in general overcoming an embedded context revealed males to perform better than females.

**Antecedents**

In the book *Psychological Differentiation*, Witkin, Dyk, Faterson, Goodenough, and Karp (1962) demonstrated children the same age differ in their cognitive style. In order to determine the origin of individual differences in children's cognitive styles, investigators have become interested in the family. In this section, the current theoretical and empirical research concerning the antecedents of cognitive styles will be presented.

Lynn (1962) postulated the acquisition of cognitive styles is related to the process of learning to identify with the appropriate sex. He stated early in life both boys and girls learn to identify with their mother. Thereafter, boys, but not girls, must shift from their initial identification with the mother to identification with the father. Because girls are around their mothers much more than boys are around their fathers, a problem of masculine sex-role identification arises for boys. However, through the culture's highly developed system of rewards for indications of masculinity and punishment for signs of femininity, boys' learned maternal identification is weakened and becomes replaced by a culturally defined, stereotyped masculine-role identification. The process of learning, therefore, is different for girls and boys. Girls simply learn a lesson whereas boys must solve a problem.
In learning the feminine identification lesson, girls acquire a learning method which involves a personal relationship with the mother and imitation of the mother's behavior. In solving the masculine-role identification problem, boys acquire a learning method which involves finding the goal (masculine role), restructuring the field (deciphering the rewards for masculinity and punishments for femininity), and abstracting principles (defining the masculine role). Lynn further hypothesized the method of learning in acquiring sex-role identification is applicable to other learning tasks, and because boys must learn a problem and girls a lesson, boys generally perform better on problem-solving tasks.

In relation to problem-solving ability, Lynn (1969) hypothesized, "a child's cognitive functioning (field-dependence) is curvilinearly related to the distance of the child from the parent of the same sex" (p. 236). Parental distance may be in terms of physical absence of the parent, extreme emotional detachment, cruelty, or brutality. Parental closeness may be in terms of caretaking by a specific parent, the child being with that parent most of the time, and strong emotional attachment. Lynn suggested cognitive functioning is maximum when the parent of the same sex is neither overly close nor distant from the child. Therefore, based on his theory of sex-role identification, Lynn hypothesized males generally to be more field-independent than females because fathers are moderately distant from their sons while mothers are closer to their daughters. However, Lynn also stated, "with the father extremely close to the boy and the mother relatively distant from the girl, boys are inferior to girls in problem solving and are more field-dependent" (p. 238).
The relation between field-dependence, parental identification, and acceptance of authority were explored in 30 male and 30 female college undergraduates. Field-dependence was measured by an eight-item EFT, and parental identification was assessed by a semantic differential. The semantic differential consisted of 12 bipolar adjectives rated on a seven-point scale. The subject first rated himself, then his mother and father. The lower the discrepancy score (perceived similarity to a parent) between the subject's rating and his rating of each parent, reflected the parent with whom the subject identified most strongly. Acceptance of authority was measured by the Bales and Couch AA scale, which has been shown to correlate highly with the F (authoritarian) scale (Bieri & Lobeck, 1959).

A Mann-Whitney test demonstrated the highest level of field-independence for males occurred when low acceptance of authority was combined with maternal identification. On the other hand, the highest level of field-independence for females occurred when low acceptance of authority was combined with paternal identification (Bieri, 1960).

Witkin, Dyk, Faterson, Goodenough, and Karp (1962) and Dyk and Witkin (1965) investigated family experiences related to the development of differentiation in children. Three groups (n = 68) of mothers and their 10-year-old children were utilized as subjects to determine whether mothers who are more differentiated have children who also are differentiated. The children were administered a series of perceptual tests (BAT, RFT, EFT) and the Wechsler Intelligence Scale for Children. All three groups of mothers were given an extensive interview; in addition, one group of mothers was given the EFT and a Human Figure Drawing Test. The characteristics of the mother as a person and the nature of her interaction with her son were
among the areas evaluated in the interview. In relation to the characteristics of the mother as a person, the predominant indicators involved the mother's sense of self-realization and self-assurance in life. In regard to mother-son interaction, the indicators included physical care, a child's past and current adaptations to school, a child's social relationships and activities, discipline, the mother's attitude toward her child, and information about family members. Ratings were made on the several indicators, and the results were summarized into an overall global impression concerning whether each mother was fostering or inhibiting differentiation in her son.

The findings showed correlations between mothers' interview-rating scores and their sons' perceptual scores to be statistically significant for all three groups ($r = .85, .65, .82, p<.01$). For one group of mothers ($n = 27$, Group II) investigated, their interview-rating scores correlated significantly ($r = .41, p<.05$) with their sons' WISC Analytical triad (PC, BD, OA) scores. The mothers' Human Figure Drawing scores also correlated significantly ($r = .48, p<.05$) with their sons' perceptual scores but were not correlated significantly ($r = .41, p>.05$) with their sons' WISC Analytical triad scores. Mothers' EFT scores also did not correlate significantly ($r = .37, p>.05$) with their sons' perceptual and ($r = .15, p>.05$) WISC Analytical triad scores. Therefore, the hypothesis that mothers who are more differentiated (more analytical) have children who also are differentiated was only partially supported.

In a somewhat similar study concerning differentiation among mothers and their sons, Scallon and Herron (1969) investigated whether or not enuretic boys and their mothers were field-dependent. Sixty lower-class
Negro and Puerto Rican males ranging in age from 6 to 12 years were employed as subjects. Fifty-five mothers also participated, 26 of whom were Negro and 29 of whom were Puerto Rican. Fifteen enuretic boys came from a pediatric outpatient clinic of a general hospital, and the other 15 enuretic boys came from a psychiatric clinic. A group of 30 nonenuretic boys coming from both institutions served as controls. The enuretic subjects were individually matched with their controls on the variables of race, age, and intelligence (Verbal IQ of the WISC). The Children's Embedded Figures Test (CEFT) and the WISC were given to the boys and the EFT to the mothers.

An analysis of variance revealed nonenuretic subjects performed better on the CEFT than enuretic subjects in both the pediatric ($F = 27.76, df = 1, p<.01$) and psychiatric ($F = 25.22, df = 1, p<.01$) clinics, but they did not perform better on the WISC Analytical triad ($F = 1.31, df = 3, p>.05$) for both populations. A Sign Test for significance also revealed mothers of enuretic children had different perceptual styles than their children in both pediatric ($Z = .28, p>.05$) and psychiatric ($Z = .50, p>.05$) clinics.

The last two studies demonstrated (Dyk & Witkin, 1965; Scallon & Herron, 1969) mothers' and sons' EFT scores were not significant. Failure to reach significance suggested other family members, particularly the father, may have a major role in the development of the child's perceptual style. Two recent studies (Schaffer, 1969; Corah, 1965) have used fathers as subjects and found contradictory results. Schaffer (1969), in an unpublished dissertation, attempted to assess parent-child similarity in psychological differentiation. The subjects were boys ($n = 40$) and girls ($n = 40$) between the ages of 10 and 12 years and their parents. Each subject
was administered the EFT to determine their level of perceptual differen-
tiation. The author found a significant sex difference for both children
and parents, with males being more field-independent than females. Percep-
tual differentiation also was found to be related to the same-sex, with
sons and fathers and daughters and mothers having similar EFT scores.

Another investigation (Corah, 1965) concerning differentiation in
children and their parents was conducted using 60 families. Thirty middle-
and upper-middle-class boys and girls between the ages of 8 and 11 years
and their parents were utilized as subjects. Two measures of differentia-
tion were obtained for each subject. The CEFT was given to children and
the EFT to their parents. The second measure of differentiation was
obtained from Human Figure Drawings made by each subject. The drawings
were rated according to the sophistication-of-body-concept scales developed
by Witkin et al. (1962).

The result demonstrated no difference between CEFT scores for boys and
girls. Girls, however, did achieve significantly higher figure drawing
scores than did boys ($t = 2.405, p<.05$). Fathers obtained EFT solutions
significantly faster than did mothers ($t = 3.991, p<.001$) whereas mothers
and fathers did not differ significantly in their figure drawing scores.
Correlations showed the level of differentiation in girls was related to
that of their fathers ($r = .41, p<.05$), and the level of differentiation in
boys was related to that of their mothers ($r = .39, p<.05$). In other
words, Corah (1965) found differentiation to be related to the opposite-
sex, instead of to the same-sex as Schaffer (1969) demonstrated.

In summary, the theoretical and empirical literature on antecedents of
cognitive style revealed parental influence to be a major factor in devel-
oping children's cognitive styles. The review incorporated theoretical information reflecting the relationship of cognitive style to sex-role identification as well as empirical data revealing same-sex and opposite-sex findings concerning perceptual and psychological differentiation in parents and children.

An important component in the area of antecedents of cognitive styles of children is the element of parental influence. The interest of the current investigation relates to the individual influence each parent has on their children's cognitive style.
Methodology

The purpose of the present study is to determine whether or not a significant relationship exists between the cognitive styles of parents and their children. A second objective is to determine whether or not (a) the cognitive styles between siblings are similar and (b) the cognitive styles between their parents are similar. The participating members of each family consisted of a mother, father, son, and daughter. The parents were given the Vocabulary (V), Picture Completion (PC), Block Design (BD), and Object Assembly (OA) subtests of the WAIS. The children were given the V, PC, BD, and OA subtests of the WISC. Both parents and children also were administered the Embedded Figures Test (EFT). All of the testing took place in the families' homes. Three family members were tested simultaneously, but individually, in separate rooms. One of the examiners then tested the fourth family member, and all of the testing took place according to a counterbalanced design.

Subjects

Fifty Caucasian families served as subjects. All of the families fell into either Class I or Class II of Hollingshead and Redlich's Two Factor Index of Social Position (Hollingshead & Redlich, 1958). Middle-class status was chosen on the basis of father's occupation and educational level. The participating members of each family were the mother, father, son, and daughter. The mothers and fathers were natural parents living at home and were not older than 50 years of age. The sons and daughters ranged in age from 11 years 0 months to 15 years 11 months with no more than 2 years 3 months difference in age. If there were more than two siblings within
the 11/0-15/11 age range, the two siblings closer in age were used. None of the children in the study were adopted. Twenty-five of the families had daughters older than sons, and the other 25 families had sons older than daughters. Most families (35) were selected from two junior high schools in St. Louis, Missouri. The remaining families (15) meeting the requirements for participation were obtained from the recommendations of previously tested subjects.

**Description of Intellectual Measurement**

In this section, the intellectual subtests utilized in the present investigation will be discussed. However, before proceeding, information concerning the reliability and the validity of the Wechsler intelligence tests (WISC, Wechsler, 1949; WAIS, Wechsler, 1955) will be presented.

Corrected split-half reliability coefficients for the WISC are very high: .88 at age 7 years 6 months, .96 at 10 years 6 months, and again at 13 years 6 months for the Verbal Scale, and .86 at 7 years 6 months, .89 at 10 years 6 months, and .90 at 13 years 6 months for the Performance Scale, giving overall coefficients .92, .95, and .94 at those ages for Full Scale (Buros, 1959). Delattre and Cole (1952) and Price and Thorne (1955) found a .87 correlation between the WISC and the Wechsler-Bellvue, Form I.

Kureth, Muhr, and Weisgerber (1952) showed correlations between the WISC and Stanford-Binet for 5- and 6-year-old children to be .79 (p<.01) and .71 (p<.01), respectively, Krugman, Justman, Wrightstone, and Krugman (1951) tested 332 children between the ages of 5 years 6 months and 15 years 6 months with the WISC and Stanford-Binet, Form L. Correlations of .74, .64, and .82 (p<.01) were obtained between the Stanford-Binet, Form L and the WISC Verbal, Performance, and Full-Scales, respectively.
Corrected split-half reliability coefficients for the WAIS are also very high: .96 at age 18-19 years, .96 at 25-34 years, and .96 at 45-54 years for the Verbal Scale and .93 at 18-19 years, .93 at 25-34 years, and .94 at 45-54 years for the Performance Scale, giving overall coefficients of .97, .97, and .97 at those ages for Full Scale (Wechsler, 1955).
Wechsler (1955) showed concurrent validity between the Stanford-Binet and the WAIS IQs to be well established. He presented specific information revealing Verbal IQ and Full Scale IQ to correlate .86 and .85 with the Stanford-Binet IQ while the Performance IQ to correlate .69 with the Stanford-Binet IQ. Buros (1959) also reports a .72 correlation between the WAIS Full Scale IQ and the Raven's Progressive Matrices.

The PC, BD, and OA are intellectual subtests of the WISC and WAIS with the purpose of determining whether an individual possesses a global or analytical approach in overcoming an embedded context. The PC, BD, and OA subtests on the WISC and WAIS have been found in a number of factor analytic studies (Goodenough & Karp, 1961; Karp, 1963; Cohen, 1957, 1959) to load on the same factor as the EFT. The combined scaled scores of the PC, BD, and OA subtests measure the same analytical-global dimension intellectually as the EFT measures perceptually. In all three subtests (PC, BD, OA), effective performance involves the capacity to overcome an embedded context.

The V subtest can be used to determine each subject's verbal intelligence. Each subject's V raw score is converted into the appropriate scaled score. The V scaled score then is prorated to determine an estimated Verbal IQ.
The reliability of the V subtest on the WISC for children 10 years 6 months and 13 years 6 months is .91 and .90, respectively (Wechsler, 1949). The reliability of the V subtest on the WAIS for adults 25 to 34 years and 45 to 54 years is .95 and .96, respectively (Wechsler, 1955).

The V subtest on the WISC (Wechsler, 1949) and WAIS (Wechsler, 1955) consists of 40 words to be defined by the subject. The directions for the WISC V subtest are:

"I want to see how many words you know. Listed carefully and tell me what these words mean. What is a _____?"

The directions for the WAIS V subtest are very similar:

"I want you to tell me the meanings of some words. Let us start with _____; What does _____ mean?"

The vocabulary words are administered in sequence, and the subtest is discontinued when the subject scores five consecutive failures (responses scored zero).

In the PC subtest of the WISC and WAIS, the subject is shown 20 meaningful pictures having an important part missing. To locate the missing part, the subject must be able to analyze the whole picture into component parts.

The reliability of the PC subtest on the WISC for children 10 years 6 months and 13 years 6 months is .66 and .68, respectively (Wechsler, 1949). The reliability of the PC subtest on the WAIS for adults 25 to 34 years and 45 to 54 years is .85 and .83, respectively (Wechsler, 1955).

The directions for the WISC and WAIS PC subtest are the same:

"I am going to show you some pictures in which there is a part missing. Look at each picture carefully and tell me what is missing. Now, look at this picture. What important part is missing?"
The subtest is discontinued when the subject scores four consecutive failures (responses scored zero because the correct part is not identified as missing in the designated amount of time) on the WISC PC subtest only. On the WAIS PC subtest, all the pictures are presented to the subject regardless of how many are incorrect.

In the BD subtest of the WISC (Wechsler, 1949) and WAIS (Wechsler, 1955), the subject is asked to copy a reference design (as shown on a card) by manipulating blocks to form the appropriate arrangement. The reference design (Gestalt) must be "broken up" into component parts if the configuration is to be reproduced.

The reliability of the BD subtest on the WISC for children 10 years 6 months and 13 years 6 months is .87 and .88, respectively (Wechsler, 1949). The reliability of the BD subtest on the WAIS for adults 25 to 34 years and 45 to 54 years is .83 and .82, respectively (Wechsler, 1955).

The directions for the WISC BD subtest are:

"You see these blocks have different colors on their different sides. They can be put together to make a design like the one you see on this card. Watch me."

The examiner then constructs design C slowly. He brushes up the blocks and says:

"Now make one like this. Go ahead. Tell me when you have finished."

The subject is given four blocks. If the subject fails on the first trial, he is given a second trial. If the subject fails on both trials of design C, he is given designs A and B, and the subtest then is discontinued. If the subject passes on either the first or the second trial of design C, he is administered designs 1 through 7. The subtest is discontinued when
there is two consecutive failures (inability to reproduce the design in designated amount of time).

The directions for the WAIS BD subtest are:

"You see these blocks. They are all alike. On some sides they are all red; on some, all white; and on some, half red and half white. I am going to put them together to make a design. Watch me."

The examiner constructs the design without exposing the reference card. Leaving the model intact, the subject is given four blocks and is told, "Now make one just like this." If the subject fails to complete the design within the time limit or arranged the blocks incorrectly, the examiner constructs the design again, and the subject is given a second trial. Whether the subject succeeds or fails on this trial, he is presented design 2. Design 2 follows the same procedure except the reference design is shown on a card rather than the examiner constructing the Gestalt as in design 1. Whether or not the subject succeeds on design 2, he is administered designs 3 through 10. The subject is shown design 3, and the examiner says:

"Now make one like this. Tell me when you have finished."

The same procedure continues for the remaining designs. The subtest is discontinued after three consecutive failures (inability to reproduce the designs in the designated amount of time).

In the OA subtest of the WISC (Wechsler, 1949) and WAIS (Wechsler, 1955), the subject is administered component parts of four objects individually and asked to assemble the parts into meaningful whole objects. Of the four objects composing the WISC OA subtest, the subject is told what the completed object is for the first two objects but not for the last two
objects. No information as to the identity of objects is given to subjects on the WAIS OA subtest.

The reliability of the OA subtest on the WISC for children 10 years 6 months and 13 years 6 months is .63 and .71, respectively (Wechsler, 1949). The reliability of the OA subtest on the WAIS for adults 25 to 34 years and 45 to 54 years is .68 and .71, respectively (Wechsler, 1955).

The WISC OA subtest consists of a manikin, a horse, a face, and an auto. The directions for the WISC OA subtest are given individually for the four objects. For the manikin and horse, the objects are identified:

"These pieces, if put together correctly, will make a boy. Go ahead and put them together."

"This is a cut up horse. Put the pieces together as quickly as you can."

For the face and auto, the directions are:

"Put this together as quickly as you can."

The WAIS OA subtest consists of a manikin, a profile, a hand, and an elephant.

The directions for the manikin object are:

"If these pieces are put together correctly, they will make something. Go ahead and put them together as quickly as you can."

For the profile, hand, and elephant objects, the examiner says:

"Put this together as quickly as you can" (Wechsler, 1949, 1955).

The PC, BD, and OA are timed subtests, and all of the subtests are administered in the standardized manner. For each subtest (PC, BD, OA), a scaled score is determined corresponding to each subject's raw score performance. The scaled scores for each subject on the three subtests then
are added to one another. The combined scaled scores represent each subject's intellectual component of their cognitive style.

**Description of Perceptual Measurement**

The EFT (Witkin, 1950) is a perceptual test with the purpose of determining whether an individual possesses a field-independent (analytical) or field-dependent (global) perceptual style based on the subject's ability to locate a simple figure within an embedded complex figure. The simple figure is incorporated in the complex figure in such a way as to be obscured perceptually. According to Witkin, Oltman, Raskin, and Karp (1971), the EFT consists of three sets of cards, two sets of 12 colored cards with complex figures numbered consecutively in order of test presentation and a set of 8 uncolored cards with simple figures designated by letters A to H. Next to the number on the reverse side of each complex figure card is printed the letter identifying the simple form which is embedded in that complex figure. There is also one practice complex figure card (labeled P-X) and an accompanying simple figure card (labeled P). Form A consists of 12 complex figure cards. A three-minute time limit is used for the subject to locate the simple figure in the complex figure. The order of presentation of the complex figures (numbers) and the simple figures (letters) for form A are as follows: 1-A, 2-B, 3-C, 4-D, 5-E, 6-A, 7-F, 8-E, 9-C, 10-G, 11-A, 12-H.

The reliability of the long form (24 trials, 5-minute format) is very high. Test-retest correlations after a one-week interval were .92 (Dana & Goocher, 1959) and .89 for both men and women after a three-year interval (Bauman, 1951). Corrected odd-even correlations for the EFT of .90
(Linton, 1952), .92 (Longenecker, 1956), .95 (Gardener, Jackson, & Messick, 1961), and .88 (Loeff, 1961) also were found (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). Reliability for the shorter form (12 trials, 3-minute format) is also very high. The correlations obtained between scores for the longer format and recomputed scores for the shorter format were .92 for a group of college men, .97 and .92 for a group of 17-year-old males and females (Witkin, Oltman, Raskin, & Karp, 1971).

Factor-analytic and correlational validity studies supply evidence that performance in the EFT is related to performance in other perceptual and intellectual tasks which involve the ability to overcome an embedded context. Witkin, Dyk, Faterson, Goodenough, and Karp (1962) reported the EFT loaded on the same factor with other perceptual tests (Gottschaldt Figures, Hidden Pictures Test) requiring the capacity to overcome an embedded context. Goodenough and Karp (1961) and Karp (1963) showed the EFT loaded on the same analytical factor as the Picture Completion, Block Design, and Object Assembly subtests of the WISC and WAIS. Intercorrelations among the EFT, PC, BD, and OA subtests were .72 (p<.01), .80 (p<.01), and .70 (p<.01), respectively (Witkin et al., 1962). Witkin et al. (1962) provided evidence that field-dependent subjects performed at a lower level than field-independent subjects on Guilford's Match problems and Insight problems which loaded on the adaptive-flexibility (analytical) factor. Intercorrelations among the EFT, Match problems, and Insight problems were .58 (p<.01) and .60 (p<.01), respectively.

In administering the EFT, the subject and examiner are seated next to each other so the examiner can present the cards and observe the subject's
tracing of the simple figure. Once seated, the following directions are given:

"I am going to show you a series of colored designs. Each time I show you one, I want you to describe it in any way you wish. I will then show you a simple form which is contained in that larger design. You will then be given the larger design again, and your job will be to locate the simple form in it. Let us go through a practice trial to show you how it is done."

The examiner shows the practice complex figure (P-X) for 15 seconds. He then covers the practice complex figure by placing the practice simple form (P) over it. After 10 seconds, he says:

"I will now show you the colored design again and you are to find the simple form in it. As soon as you have found the simple form let me know, and start tracing the simple form with the stylus. When you are tracing, do not let the stylus touch the surface of the card."

The examiner then exposes the complex figure again by removing the simple form and turning it over. The examiner, using a stopwatch, then starts timing from zero. As soon as the subject says he saw the simple form, the examiner notes the time. If the subject traces the simple form correctly, the time is recorded on the data sheet as the solution time for the practice item. If a subject has difficulty finding the simple form in the practice complex figure, the examiner exposes the simple form again and shows the subject where it is located in the complex form. After the practice item, the examiner says:

"This is how we will proceed on all trials. In every case the simple form will be present in the larger design. It will always be in the upright position, so don't turn the card around. There may be several of the simple forms in the same design, but you are to find and trace only one. Work as quickly as you can, since I will be timing you, but be sure that the form you find is exactly the same as the original simple form in shape, size and proportions. As soon as you have found the form, tell me at once and then start to trace it. If you ever forget what the
simple form looks like, you may ask to see it again, and you may
do so as often as you like. Are there any questions?"

After the instructions, the complex figures are shown in the prescribed
sequence. Each complex figure card is exposed for 15 seconds, then the
simple form is exposed for 10 seconds covering the complex figure and,
finally, the simple form is removed and the timing started.

In the timing procedure, the stopwatch is started from zero as soon as
the simple form is removed, and the subject is requested to locate and
trace the simple figure in the complex figure. When the subject reports he
saw the simple form, the examiner notes the time elapsed but does not stop
the watch. If the subject's tracing is correct, the time noted before the
tracing began is recorded in Column 3 of the data sheet. If the subject's
tracing is incomplete or inaccurate, the examiner says, "No, that's not
it," and continues to let the watch run. The examiner records the time
when the subject first reports he has found the simple form in Column 3
with an (X) after it to indicate the solution is incorrect. When the sub­
ject again reports he has found the simple form, the examiner notes the
time but does not record it until the tracing itself is also correct. If
the subject does not find the simple form in three minutes, the examiner
says, "Let's try another one," and turns to the next complex figure in
sequence. The examiner then records the solution time as 180 seconds.

The subject is allowed to examine the simple form as often as he
requests. When the simple figure is shown again, the examiner stops the
watch and places the simple form over the complex figure for 10 seconds.
Since the stopwatch is off at this time, the examiner determines the 10-
second interval by counting to himself. When the 10-second period is up,
the examiner removes the simple form, exposing the complex figure, and restarts the watch. Each time the subject is shown the simple figure, the time as well as the letter "S" (timing stopped) is recorded in Column 2 on the data sheet. The solution time for each item is converted into seconds and recorded in Column 4 on the data sheet. Failed items are entered as 180 seconds. The solution times for the 12 items are summed and divided by 12. The resulting value, which is the mean solution time per item, is the subject's score for the test. The mean solution time represents each subject's perceptual component of his cognitive style (Witkin, Oltman, Raskin, & Karp, 1971).

Training of Examiners

Two examiners were selected and trained to administer the Vocabulary, Picture Completion, Block Design, and Object Assembly subtests of both the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Adult Intelligence Scale (WAIS). The examiners also were trained to administer the Embedded Figures Test (EFT). Two training sessions were held for each of the examiners. ¹

Preceding the first session, WISC (Wechsler, 1949), WAIS (Wechsler, 1955), and EFT (Witkin, Oltman, Raskin, & Karp, 1971) manuals were provided to the examiners to study the directions of each of the tests and to familiarize themselves with the testing material.

At the first session, the procedure and directions discussed in the manuals were reviewed and questions were answered. Following the discus-

¹The two trained examiners were Jeanne Oliver and Mary Oliva.
sion of the questions, the trainee examiners were introduced to the record forms for each of the tests. After a discussion of the record forms, the researcher demonstrated common responses on each of the tests, and the two trainee examiners scored them on the record forms. This exercise continued until both trainee examiners correctly scored the practice responses. By the end of the first session, both trainee examiners were familiar with the record forms and the clerical work involved in scoring the responses.

The second session occurred one week after the first session and involved the two trainee examiners giving a practice administration and scoring demonstration on each of the tests to the researcher. Following each of the demonstrations, questions were answered, advice and corrections concerning instructions were given, and a general discussion concerning testing procedure took place.

After the second session, both trainee examiners were instructed to find people who would be willing to be tested in order for the trainee examiners to get practice giving the tests. Both trainee examiners tested six people during the training period under supervision from the researcher. Once the researcher was satisfied with the two trainee examiners' skills in administering and scoring the testing, training was terminated. The duration of the entire training period was approximately one and one-half months.

**Procedure**

The researcher contacted the principals of two junior high schools in St. Louis, Missouri, in order to utilize some of the students in the present investigation. The researcher met with the principals individually and
explained the study. The researcher typed and xeroxed copies of the requirements for participating in the investigation (Appendix A) and gave them to the principals. The principals then sent the material to each of the teachers with a cover letter explaining the project and asking the teachers to present the project to the students in their classes. The teachers briefly explained the project and read the requirements for participation to their students. The students whose family met all of the requirements for participating in the study were requested to go home and discuss the project with their parents. The students were instructed to respond to the teacher whether or not their families were interested in participating. The teachers then compiled a list of names, addresses, and telephone numbers of each family who responded positively to the investigation and gave the lists to the principals. After receiving the information from the teachers, the principals called the researcher and gave him the information for each of the families.

Letters then were sent to the parents explaining the investigation in more detail and again asking for their participation (Appendix B). A telephone call followed the contact by letter and, if the parents agreed to participate, an appointment for testing was arranged.

Testing took place in the subjects' homes on weekdays in the evening hours (approximately 7-9:30 p.m.) and on weekends during the day. Testing was performed by the researcher and two trained examiners. The three examiners went to each family's home and tested three of the family members simultaneously, but individually. One of the three examiners then tested the fourth family member. The entire testing procedure took approximately two and one-half hours for each family unit. Testing took place according
to a counterbalanced design so there was an equal distribution of adults and children tested by each examiner. Each subject was tested in a separate room to minimize interference from the other family members and to maximize suitable testing conditions.

The sequence of testing was the same for each subject. The V subtest was given first, followed by the PC, BD, OA subtests, and the EFT.

**Description of Statistical Analysis**

The dependent variables in the present investigation are measures of cognitive style, and the independent variables are family, sex, and family position (i.e., father, mother, sister, brother).

Combined scaled scores for the PC, BD, and OA subtests from the Wechsler intelligence tests (Wechsler, 1949, 1955) and mean score performances on the EFT were obtained from fifty families consisting of a mother, father, son, and daughter. Vocabulary scale score data also were obtained from the Wechsler intelligence tests (Wechsler, 1949, 1955) for each participating member to determine an estimated Verbal IQ. Siblings in each family were coded for age to see if older siblings perform better on cognitive measures than younger siblings.

To analyze the data, a 12X12 multitrait-multimethod correlational matrix\(^2\) was utilized. The multitrait-multimethod matrix consists of three traits (Analytical triad, EFT, and Verbal IQ scores) and four methods (mother, father, son, and daughter) generating 12 separate variables. The

\(^2\)Dr. Leroy Wolins of the Iowa State University Statistical Laboratory served as statistical consultant for the present investigation.
resulting matrix represents intercorrelations concerning the several traits and methods utilized in the current investigation.
Results

A 12X12 multitrait-multimethod correlational matrix is reported in Table 1. The matrix consists of three traits (Analytical triad, EFT, and Verbal IQ scores) and four methods (mothers, fathers, sons, and daughters). In order to facilitate understanding of the matrix, method and trait variables have been arranged according to the scheme provided by Campbell and Fiske (1959). The matrix is arranged schematically into four triangular and six rectangular submatrices. The four triangular submatrices (adjacent to the reliability or major diagonal) contain intercorrelations for variables having only the method in common (heterotrait monomethod intercorrelations). The six rectangular submatrices contain intercorrelations for variables having neither the trait nor the method in common (heterotrait heteromethod intercorrelations). The validity diagonals or underlined coefficients in the rectangular submatrices contain intercorrelations for variables having only the trait in common (monotrait heteromethod intercorrelations). The two monotrait heteromethod triangular submatrices (Tables 2 and 3), derived from the underlined intercorrelations in the rectangular submatrices, represent the major findings for this study.

The following null hypotheses were proposed for the study:

1. There is no significant relationship between fathers and/or mothers and their sons in the perceptual dimension (field-independence-dependence) of cognitive style.

2. There is no significant relationship between fathers and/or mothers and their sons in the intellectual dimension (analytical-global) of cognitive style.

3. There is no significant relationship between fathers and/or mothers and their daughters in the perceptual dimension (field-independence-dependence) of cognitive style.
TABLE 1

Intercorrelations among Three Cognitive Measures\(^a\) for Four Family Members (Number of Families = 50)

<table>
<thead>
<tr>
<th>Traits</th>
<th>Mothers</th>
<th>Fathers</th>
<th>Sons</th>
<th>Daughters</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>AT</td>
<td>EFT</td>
<td>VIQ</td>
<td>AT</td>
</tr>
<tr>
<td></td>
<td>AT</td>
<td>EFT</td>
<td>VIQ</td>
<td>AT</td>
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<td></td>
<td>AT</td>
<td>EFT</td>
<td>VIQ</td>
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<tr>
<td></td>
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<td>EFT</td>
<td>VIQ</td>
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<tr>
<td>AT</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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<tr>
<td>VIQ</td>
<td>49</td>
<td>26</td>
<td>X</td>
<td></td>
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<tr>
<td>AT</td>
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<td>06</td>
<td>23</td>
<td>78</td>
</tr>
<tr>
<td>VIQ</td>
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<td>22</td>
<td>29</td>
<td>03</td>
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<tr>
<td>AT</td>
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<td>22</td>
</tr>
<tr>
<td>EFT</td>
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<td>37</td>
<td>20</td>
<td>37</td>
</tr>
<tr>
<td>VIQ</td>
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<tr>
<td>EFT</td>
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</tr>
<tr>
<td>VIQ</td>
<td>37</td>
<td>39</td>
<td>27</td>
<td>07</td>
</tr>
</tbody>
</table>

Significance Levels: \(p<.05 = .279; p<.01 = .361\).

\(^a\)Code for Cognitive Measures: AT = Analytical Triad (PC, BD, OA)  
EFT = Embedded Figures Test  
VIQ = Verbal Intelligence Quotient (V).
TABLE 2

Monotrait Heteromethod Triangular Submatrix for the Perceptual Dimension of Cognitive Style

<table>
<thead>
<tr>
<th></th>
<th>Mothers</th>
<th>Fathers</th>
<th>Sons</th>
<th>Daughters</th>
</tr>
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<tbody>
<tr>
<td>Mothers</td>
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<td></td>
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<tr>
<td>Daughters</td>
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<td>.40</td>
<td>.35</td>
<td>X</td>
</tr>
</tbody>
</table>

Significance levels: p<.05 = .279; p<.01 = .361.

TABLE 3

Monotrait Heteromethod Triangular Submatrix for the Intellectual Dimension of Cognitive Style

<table>
<thead>
<tr>
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<th>Fathers</th>
<th>Sons</th>
<th>Daughters</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tr>
<tr>
<td>Fathers</td>
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<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sons</td>
<td>.62</td>
<td>.22</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Daughters</td>
<td>.34</td>
<td>.19</td>
<td>.47</td>
<td>X</td>
</tr>
</tbody>
</table>

Significance levels: p<.05 = .279; p<.01 = .361.
4. There is no significant relationship between fathers and/or mothers and their daughters in the intellectual dimension (analytical-global) of cognitive style.

5. There is no significant relationship between brothers and sisters in the perceptual dimension (field-independence-dependence) of cognitive style.

6. There is no significant relationship between brothers and sisters in the intellectual dimension (analytical-global) of cognitive style.

7. There is no significant relationship between fathers and mothers in the perceptual dimension (field-independence-dependence) of cognitive style.

8. There is no significant relationship between fathers and mothers in the intellectual dimension (analytical-global) of cognitive style.

**Major Findings**

The intercorrelations in Table 1 reflect a positive relationship among all scores except the -.04 correlation between the siblings' VIQ and EFT scores. The signs of the intercorrelations have been changed so high scores on the cognitive measures represent good performances. Therefore, in this investigation every correlation is in the anticipated direction except the -.04 correlation. Further examination of Table 1 shows that the highest monotrait heteromethod correlation (.62) occurred between the mothers' and sons' analytical triad scores. Other results also tend to indicate that older siblings perform better on cognitive measures than younger siblings, but the correlations do not reach significance (Appendix C).

Viewing the triangular submatrix for the perceptual dimension (Table 2) of cognitive style, a statistically significant relationship was found between fathers' and sons' EFT scores ($r = .30$, $df = 48$, $p < .05$). Signifi-
cance also was found between mothers' and sons' EFT scores \( r = .37, df = 48, p < .01 \). These results seem to show that fathers and sons as well as mothers and sons have significantly related perceptual styles. Therefore, the null hypothesis that there is no significant relationship between fathers and/or mothers and their sons in the perceptual dimension of cognitive style is rejected.

Examining the triangular submatrix for the intellectual dimension (Table 3) of cognitive style, fathers' and sons' analytical triad \( (PC, BD, OA) \) scores failed to reach significance \( r = .22, df = 48, p > .05 \). However, a significant relationship was found between mothers' and sons' analytical triad scores \( r = .62, df = 48, p < .01 \). Hence, the null hypothesis that there is no significant relationship between fathers and/or mothers and their sons in the intellectual dimension of cognitive style is rejected for the mother-son relationship.

Inspection of the results for the perceptual dimension of cognitive style (Table 2) shows fathers' and daughters' EFT scores to be statistically significant \( r = .40, df = 48, p < .01 \). On the other hand, the relationship between mothers' and daughters' EFT scores failed to reach significance \( r = .27, df = 48, p > .05 \). These findings tend to indicate that fathers and daughters have significantly related perceptual styles and mothers and daughters have related perceptual styles, but the correlation does not reach significance. The null hypothesis, then, that there is no significant relationship between fathers and/or mothers and their sons in the perceptual dimension of cognitive style is rejected for the father-daughter relationship.
The findings (Table 3) indicate that fathers' and daughters' analytical triad scores failed to reach statistical significance ($r = .19$, $df = 48$, $p > .05$). A further look at the data reveals mothers' and daughters' analytical triad scores ($r = .34$, $df = 48$, $p < .05$) to be statistically significant. Consequently, the null hypothesis that there is no significant relationship between fathers and/or mothers and their daughters in the intellectual dimension of cognitive style is rejected for the mother-daughter relationship.

Examining Table 2, the results show that brothers' and sisters' EFT scores were statistically significant ($r = .35$, $df = 48$, $p < .05$). These results suggest that brothers and sisters have significantly related perceptual styles. Therefore, the null hypothesis that there is no significant relationship between brothers and sisters in the perceptual dimension of cognitive style is rejected.

The relationship between brothers and sisters concerning the intellectual dimension of cognitive style (Table 3) also proved to be statistically significant ($r = .47$, $df = 48$, $p < .01$). In other words, brothers' and sisters' performances on the analytical triad subtests were related. Thus, the null hypothesis that there is no significant relationship between brothers and sisters in the intellectual dimension of cognitive style is rejected.

Fathers' and mothers' EFT scores (Table 2) failed to reach statistical significance ($r = .06$, $df = 48$, $p > .05$). Therefore, the null hypothesis that there is no significant relationship between fathers and mothers in the perceptual dimension of cognitive style failed to be rejected. Likewise, the null hypothesis that there is no significant relationship between
fathers and mothers in the intellectual dimension of cognitive style also failed to be rejected since there was no significant relationship involving fathers' and mothers' analytical triad (Table 3) scores ($r = .21$, $df = 48$, $p>.05$). The means and standard deviations for each family member on the analytical triad (PC, BD, OA) subtests and the EFT are presented in Appendix D.

Ancillary Findings

The monotrait heteromethod triangular submatrix for verbal intelligence is represented schematically in Table 4. The results show that fathers' and sons' Verbal IQ scores failed to reach significance ($r = .14$, $df = 48$, $p>.05$). Mothers' and sons' Verbal IQ scores also failed to reach significance ($r = .05$, $df = 48$, $p>.05$). Further results indicate that fathers' and daughters' Verbal IQ scores were significantly related ($r = .28$, $df = 48$, $p<.05$) and mothers' and daughters' Verbal IQ scores were not significantly related ($r = .27$, $df = 48$, $p>.05$). Other results show brothers' and sisters' ($r = .44$, $df = 48$, $p<.01$) and fathers' and mothers' ($r = .29$, $df = 48$, $p<.05$) Verbal IQ scores to be significantly related.

The following are the estimated verbal intelligence mean scores for each family member. Mothers had a mean of 120.94, fathers had a mean of 123.44, sons had a mean of 114.52, and daughters had a mean of 109.66. The mean score for verbal intelligence is 100 in the normative populations of the WISC and WAIS for both children and adults, respectively. Therefore, a comparison between the verbal intelligence mean score for each family member and the normative verbal intelligence mean score shows that the families in this investigation are above average in verbal intelligence. The
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</thead>
<tbody>
<tr>
<td>Mothers</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fathers</td>
<td>.29</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sons</td>
<td>.05</td>
<td>.14</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Daughters</td>
<td>.27</td>
<td>.28</td>
<td>.44</td>
<td>X</td>
</tr>
</tbody>
</table>

*Significance levels: p<.05 = .279; p<.01 = .361.*

Means and standard deviations for each family member on the vocabulary (V) subtest are presented in Appendix D.
Discussion

The perceptual and intellectual components of cognitive style for same-sex and opposite-sex relationships involving fathers, mothers, sons, and daughters will be discussed in this section. Results, limitations, and implications for child development, parents, educators, and future research also will be presented.

Perceptual Component of Cognitive Style

Fathers' ($r = .30$, $df = 48$, $p < .05$) and mothers' ($r = .37$, $df = 48$, $p < .01$) EFT scores were found to be significantly related with their sons' EFT scores. On the other hand, fathers' and daughters' EFT scores were significantly related ($r = .40$, $df = 48$, $p < .01$), and mothers' and daughters' EFT scores failed to reach significance ($r = .27$, $df = 48$, $p > .05$). A correlation of .279 or .28 is needed for significance at the .05 level. Although mothers' and daughters' EFT scores were not statistically significant, a closer examination of the mother-daughter correlation shows a strong trend in the anticipated direction.

These findings tend to indicate that parents are influential in the development of their children's perceptual styles. More importantly, the results show opposite-sex parent-child relationships to have higher correlations. Therefore, opposite-sex parents seem to have more of an influence on their sons' and daughters' perceptual styles than same-sex parents.

However, these results received only a limited amount of support from previous findings. Bieri (1960) reported the highest level of field-independence for males and females occurred when they identified with their opposite-sex parents. Corah (1965) and Schaffer (1969) utilizing fathers
and mothers in perceptual style research found contradictory results. Corah (1965) demonstrated a cross-sex relationship between parents and their children concerning perceptual and psychological differentiation. More specifically, he showed the level of differentiation in boys was significantly related to their mothers but not their fathers, while the level of differentiation in girls was significantly related to their fathers but not to their mothers. Schaffer (1969), however, demonstrated a same-sex relationship between parents and their children concerning perceptual styles. In other words, fathers' and sons' EFT scores and mothers' and daughters' EFT scores were significantly related.

Witkin, Dyk, Faterson, Goodenough, and Karp (1962) and Dyk and Witkin (1965), using a number of measures of differentiation, attempted to determine if mothers who are differentiated have children who also are differentiated. The authors reported, specifically concerning perceptual differentiation, mothers' EFT scores did not correlate significantly with their sons' EFT scores. Scallon and Herron (1969) found similar results.

In the present investigation, a significant relationship also was shown between brothers' and sisters' EFT scores ($r = .35, df = 48, p < .05$). No significant relationship was found to exist between mothers' and fathers' EFT scores ($r = .06, df = 48, p > .05$). These results seem to indicate that siblings' EFT scores covary more consistently than fathers' and mothers' EFT scores. One possible explanation for the significant and lack of significant findings concerning siblings' and parents' perceptual styles may be the sharing of hereditary factors existing in siblings and not in parents.
Intellectual Component of Cognitive Style

Fathers' analytical triad scores were not found to be significantly related to their sons' ($r = .22$, df = 48, $p > .05$) or daughters' ($r = .19$, df = 48, $p > .05$) analytical triad scores. On the other hand, mothers' analytical triad scores were significantly related to their sons' ($r = .62$, df = 48, $p < .01$) and daughters' ($r = .34$, df = 48, $p < .05$) analytical triad scores. These findings suggest that mothers have more influence on children's analytical ability than fathers.

One reason for the mother's greater influence on their children's analytical ability may be due to the mother-child identification process in the first few years of development. According to Lynn (1962), children in these earlier years learn to identify primarily with their mother. In these early years of development, mothers spend a great deal of time interacting with their children and helping them learn about their environment. Through this learning process, children begin modeling many of their mothers' behaviors as well as acquiring many of their characteristics. Therefore, due to the greater opportunity of mothers than fathers to serve as models for their children's development, it seems highly probable that mothers would have more of an influence on their children's abilities and development.

Witkin, Dyk, Faterson, Goodenough, and Karp (1962) have shown empirical support for the influence mothers have on their children. The authors attempted to discover if mothers who are differentiated also have children who are differentiated. Each mother was given an extensive interview to determine if they foster or inhibit differentiation in their sons. A number of other measures of differentiation also were given to each mother and
their son. The overall findings showed that mothers who were differentiated also fostered differentiation in their sons.

A specific finding, relevant to this section, indicated that mothers' interview ratings of fostering or inhibiting differentiation in their sons were correlated significantly with their sons' performances on the PC, BD, and OA subtests on the WISC. The authors, therefore, concluded that mothers' interactions with their sons early in life and thereafter are extremely important in the development of their sons' analytical ability and level of differentiation.

A significant relationship also was found in the present investigation between brothers' and sisters' analytical triad scores ($r = .47$, $df = 48$, $p < .01$), and fathers' and mothers' analytical triad scores failed to reach significance ($r = .21$, $df = 48$, $p > .05$). These findings tend to suggest that siblings' performances on the PC, BD, and OA subtests of the WISC were related more than their parents' performances on the same subtests of the WAIS. A potential reason for the significant and lack of significant findings between siblings' and parents' analytical triad scores may be the common hereditary background existing in siblings and not in parents.

**Cognitive Style**

From the findings, it can be concluded that the mother-son relationship was the only parent-child relationship to have a significantly related cognitive style. However, both parents established significant relationships with their children on the individual components of cognitive style.

Mothers showed a significant relationship with their sons on both the EFT and the PC, BD, and OA subtests of the Wechsler intelligence tests.
Mothers also revealed a significant relationship with their daughters on the PC, BD, and OA subtests of the Wechsler intelligence tests. However, their relationship on the EFT just missed significance at the .05 level. Fathers demonstrated a significant relationship with their sons and daughters on the EFT but not on the PC, BD, and OA subtests of the Wechsler intelligence tests.

Other findings between siblings and parents seem to show discrepant results. Siblings exhibited significant relationships on both the EFT and the PC, BD, and OA subtests of the WISC. On the other hand, their parents' performances on both the EFT and the PC, BD, and OA subtests of the WAIS failed to reach significance. Therefore, siblings were found to have a significantly related cognitive style and their parents were found to have a related cognitive style, but their correlations did not reach significance.

Several reasons limit the generalizations of this research. The two siblings utilized in each family were a son and daughter who were not more than 2 years 3 months apart in age. Siblings were limited to the 11/0-15/11 age range, and their parents were not older than 50 years of age. The participating families were from the middle- and upper-middle-socio-economic levels, and the entire population tested included only Caucasian families. Middle-class status was chosen on the basis of father's occupation and educational level. Therefore, a bias in regard to fathers' mean performance is present. This bias may be noteworthy in regard to the interpretations of fathers' mean scores on the three cognitive measures.
Implications for Child Development

The area of parental influence on children's cognitive style has received very few empirical investigations. In trying to understand the origin of individual differences in children's cognitive style, an attempt was made to empirically determine whether or not parents are an important antecedent in this area. This study, therefore, contributes to the basic research (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962; Corah, 1965; Schaffer, 1969) in the field of child development concerning parents as antecedents of their children's cognitive style.

The results of the present investigation seem to indicate that both parents contribute to the development of their children's cognitive style, but mothers seem to have more of an influence than fathers. The findings also show that in a majority of parent-child relationships concerning the perceptual and intellectual components of cognitive style, opposite-sex relationships tend to demonstrate higher correlations. In summary, then, this investigation provides the field of child development with relevant knowledge concerning parental influence in the development of their children's cognitive style.

Implications for Parents and Educators

Throughout the literature in child development and specifically in the subject area of parent-child relationships, there is a large quantity of information concerning parental influence on children's development. However, there is very little information available concerning parental influence on children's cognitive style. Therefore, findings from parent-child relationships involving cognitive style should be useful in providing par-
ents with relevant information in this area. Specific information determining whether parents have individual or combined influence on their children's cognitive style and whether each parent's influence relates primarily to the same-sex or opposite-sex child should be of interest.

The results of this study suggest that both parents are important in the development of their children's cognitive style, but mothers seem to have more of an influence than fathers. The findings also indicate that opposite-sex parent-child relationships have more significant results than same-sex parent-child relationships in the perceptual and intellectual components of cognitive style. In addition, the mother-son relationship was the only parent-child relationship to have a significantly related cognitive style. From the results of this investigation, then, parents were found to be an important antecedent in the development of their children's cognitive style.

Educators can utilize the results of this investigation in a few ways. In teaching courses pertaining to parent-child relationships, instructors can inform their students about the influence parents have on children's cognitive style. More specifically, educators can impart the information gleaned from this study that both parents contribute to the development of children's cognitive style, but mothers have a more significant influence than fathers.

Secondly, and more importantly, instructors can extrapolate from the results to familiarize their students with the important influence parents have on their children's overall development. By educators supplying information about the influence parents have on children's cognitive style and development per se, two major goals may be achieved. The first would be to stimulate students to think about the concept of parenthood, and the second would be to help students become more aware and knowledgeable about
the potential influence they will have on their children when they become parents.

Implications for Future Research

Since the area of cognitive style concerning parent-child relationships has not been investigated extensively, a variety of suggestions for future research are apparent.

In this study, opposite-sex siblings were found to have a significantly related cognitive style. A problem for future research could be to determine if same-sex siblings, either brothers or sisters, have a significantly related cognitive style. The influence each parent has on their sons' or daughters' style of functioning also would be of interest.

The question of whether or not ordinal position has an affect on cognitive style could be explored. Parent-child relationships also could be investigated to discover the influence parents have on first- and second-born siblings concerning their children's style of functioning.

Many of the mothers in the families participating in the present investigation were unemployed outside the home. Perhaps a study exploring the differential effects of working mothers and nonworking mothers on children's cognitive style could be investigated.

Further research also is needed in determining if hereditary and/or environmental factors are important in the development of children's cognitive style. A study involving parental influence on identical twins' mode of functioning would provide further hereditary data in determining the origin of children's cognitive style. An equally important area of investigation would be to explore whether or not specific types of parent-child
interactions and child-rearing patterns influence the development of children's cognitive style.

The present investigation employed a white, middle- and upper-middle-class population. The effect of parental influence on children's cognitive style in lower socioeconomic groups is a problem for future research. A need exists for such an investigation, since all of the cognitive style research involving parent-child relationships has been conducted with middle-income families.

Only through continued research concerning the antecedents of children's cognitive style will a better understanding of the origin of cognitive style be established.
Summary

The present investigation was designed to determine whether or not a significant relationship existed between the cognitive styles of parents and their children. A second objective was to determine whether or not (a) the cognitive styles between siblings were similar and (b) the cognitive styles between their parents were similar. The following null hypotheses were tested:

1. There is no significant relationship between fathers and/or mothers and their sons in the perceptual dimension (field-independence-dependence) of cognitive style.

2. There is no significant relationship between fathers and/or mothers and their sons in the intellectual dimension (analytical-global) of cognitive style.

3. There is no significant relationship between fathers and/or mothers and their daughters in the perceptual dimension (field-independence-dependence) of cognitive style.

4. There is no significant relationship between fathers and/or mothers and their daughters in the intellectual dimension (analytical-global) of cognitive style.

5. There is no significant relationship between brothers and sisters in the perceptual dimension (field-independence-dependence) of cognitive style.

6. There is no significant relationship between brothers and sisters in the intellectual dimension (analytical-global) of cognitive style.

7. There is no significant relationship between fathers and mothers in the perceptual dimension (field-independence-dependence) of cognitive style.

8. There is no significant relationship between fathers and mothers in the intellectual dimension (analytical-global) of cognitive style.

Fifty Caucasian families served as subjects. Families were selected from two junior high schools in St. Louis, Missouri, and from the recommen-
dataions of previously tested subjects. All of the families were in Class I or Class II of Hollingshead and Redlich's Two Factor Index of Social Position. The participating members of each family were the mother, father, son, and daughter. The mothers and fathers were natural parents living at home and were not older than 50 years of age. The sons and daughters ranged in age from 11 years 0 months to 15 years 11 months with no more than 2 years 3 months difference in age. Twenty-five of the families had daughters older than sons, and the other 25 families had sons older than daughters.

The parents were administered the Vocabulary (V), Picture Completion (PC), Block Design (BD), and Object Assembly (OA) subtests of the Wechsler Adult Intelligence Scale (WAIS). The children were administered the same subtests from the Wechsler Intelligence Scale for Children (WISC). Both parents and children also were administered the Embedded Figures Test (EFT). Three family members were tested simultaneously by the researcher and two trained examiners. The fourth family member was tested by one of the examiners, and all of the testing took place according to a counterbalanced design.

The data were analyzed by a 12x12 multitrait-multimethod correlational matrix. The matrix consists of three traits (Analytical triad, EFT, and Verbal IQ scores) and four methods (mothers, fathers, sons, and daughters) generating 12 separate variables.

A significant relationship was found between father-son and father-daughter EFT scores, and father-son and father-daughter analytical triad (PC, BD, OA) scores failed to reach significance. Mother-son EFT scores were significantly related, and mother-daughter EFT scores were not signifi-
cantly related. However, mother-son and mother-daughter analytical triad scores were significantly related. Therefore, the only parent-child relationship to have significantly related cognitive styles was the mother-son relationship.

Siblings were found to have significantly related EFT scores and analytical triad scores. On the other hand, their parents' EFT scores and analytical triad scores failed to reach significance. Siblings, then, were found to have significantly related cognitive styles and their parents were found to have related cognitive styles, but their correlations did not reach significance.

Father-son Verbal IQ scores failed to reach significance. On the other hand, a significant relationship was found between father-daughter Verbal IQ scores. Mother-son and mother-daughter Verbal IQ scores also failed to reach significance. However, siblings' Verbal IQ scores were significantly related as well as their parents' Verbal IQ scores.

Implications for child development, parents, educators, and future research also were discussed.


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Zigler, E. Zigler stands firm. Contemporary Psychology, 1963, 8, 459-461. (b)
Acknowledgments

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Acknowledgments are expressed to the principals and teachers of Florissant and Brentwood Junior High Schools, St. Louis, Missouri, for their assistance in obtaining subjects for this investigation. To the students and their parents who made this endeavor possible, the writer extends sincere and genuine appreciation.

To my wife, Jeanne, a very special acknowledgment for her understanding, encouragement, and support throughout and for her help in the collection of the data. My thanks also are extended to Mary Oliva, for her time and assistance in the collection of the data.
Appendix A: Requirements for Participating in Study
Requirements for Participating in Study

1. A family with a Mother, Father, Son, and Daughter. (Family unit, however, may consist of more than two siblings.)

2. The mother and father must be natural parents living at home and cannot be older than 50 years of age.

3. The son and daughter must be in the 11/0-15/11 age range (years/months) and cannot be more than 2 years 3 months apart in age. For example:
   One child may be 11/2 and the other could be any age up to and including 13/5.

4. Middle-class (based on father's education and occupation).

5. Race: White
Appendix B: Letter to Parents
Dear Mr. and Mrs.,

Have you ever wondered how your child goes about solving problems he experiences? Have you ever wondered if he approaches problems the way you do? As a doctoral student in child development, I am interested in questions such as these. My present interest is to find out if parents (mothers and fathers) and their sons and daughters solve problems in visual and nonverbal activities differently or in the same way. To find out the answer to these questions, I need your help.

I would appreciate it very much if you allow my assistants and me to come to your home and get your reactions to two different tasks. One is a visual task which involves finding simple designs in complex designs on printed cards. The other task involves picking out parts that are missing from pictures as well as putting separated parts of objects together to make whole objects. For example, you may be presented a picture of a house with a chimney missing. You are to respond that the chimney is missing. Also, you may be given separated parts of a house and your job is to put the house together. The entire testing session will take only one hour and fifteen minutes per person. My assistants and I will test three of you at the same time and then the other member of the family, so we will only take up a limited amount of your time.

I will contact you in a few days to answer any questions you may have and to talk about arrangements for a convenient time to do the testing. Also, if you are interested in knowing the results, I would be very happy to explain them to you.

Sincerely,

Ronald Oliver
Appendix C: Correlations of the Dichotomous Variable; 1 = Boys Older, 0 = Girls Older; with the Three Cognitive Variables
TABLE 5

Correlations of the Dichotomous Variable; $^a$ 1 = Boys Older, 0 = Girls Older; $^b$ with the Three Cognitive Variables $^c$ (Number of Families = 50)

<table>
<thead>
<tr>
<th></th>
<th>AT</th>
<th>EFT</th>
<th>VIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brothers Older</td>
<td>-.03</td>
<td>.06</td>
<td>-.09</td>
</tr>
<tr>
<td>Sisters Older</td>
<td>-.18</td>
<td>-.21</td>
<td>-.27</td>
</tr>
</tbody>
</table>

Signs of correlations have been changed so high scores on the cognitive variables represent good performances.

Significance levels: $p < .05 = .279$; $p < .01 = .361$.

$^a$ Data coded, 1 = boys older, 0 = girls older.

$^b$ Code for Cognitive Variables: AT = Analytical Triad (PC, BD, OA)
EFT = Embedded Figures Test
VIQ = Verbal Intelligence Quotient (V).
Appendix D: Means and Standard Deviations on Three Cognitive Measures for Four Family Members
TABLE 6
Means and Standard Deviations on Three Cognitive Measures\(^a\)
for Four Family Members\(^b\) (Number of Families = 50)

<table>
<thead>
<tr>
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<th>Means</th>
<th>Standard deviations</th>
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<tbody>
<tr>
<td></td>
<td>AT</td>
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<tr>
<td>M</td>
<td>EFT</td>
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</tr>
<tr>
<td></td>
<td>VIQ</td>
<td>120.94</td>
</tr>
<tr>
<td></td>
<td>AT</td>
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</tr>
<tr>
<td>F</td>
<td>EFT</td>
<td>44.98</td>
</tr>
<tr>
<td></td>
<td>VIQ</td>
<td>123.44</td>
</tr>
<tr>
<td></td>
<td>AT</td>
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</tr>
<tr>
<td>S</td>
<td>EFT</td>
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<tr>
<td></td>
<td>VIQ</td>
<td>114.52</td>
</tr>
<tr>
<td></td>
<td>AT</td>
<td>36.92</td>
</tr>
<tr>
<td>D</td>
<td>EFT</td>
<td>60.98</td>
</tr>
<tr>
<td></td>
<td>VIQ</td>
<td>109.66</td>
</tr>
</tbody>
</table>

Lower mean score on EFT represents better performance.

Middle-class status was chosen on the basis of father's occupation and educational level. Therefore, a bias in regard to the means is present for fathers' performance on the three cognitive measures.

\(^a\)Code for Cognitive Measures: AT = Analytical Triad (PC, BD, OA)
EFT = Embedded Figures Test
VIQ = Verbal Intelligence Quotient (V).

\(^b\)Code for Family Members: M = Mothers
F = Fathers
S = Sons
D = Daughters.