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AN EXPLORATION OF THE RELATIONS AMONG READING, LANGUAGE, AND COGNITIVE STYLE

by

MARY ANASTASIA GRANT

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "An Exploration of the Relations Among Reading, Language and Cognitive Style", submitted by Mary Anastasia Grant in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

The purpose of the present study was an exploration of the relations among reading, language and cognitive style. Specifically, the study was concerned with three questions: (1) To what extent is unity of verbal habit demonstrated in measures of language performance when these measures are analyzed in terms of language differentation? (2) Are the qualitative patterns of responses to selected measures of language differentiation significantly related to performance on measures of reading comprehension? (3) What are the relations between individual differences in cognitive style and variations in performance in reading and language?

A basic concept employed in the study was that of differentiation, a concept which has been popular in relation to the problems of the developmental aspects of cognitive structure. Language was examined from the point of view of developmental progression, and language measures were chosen which allow the subject to give direct expression of his language maturity.

The relevance of the factors of sex, intelligence, and spontaneous flexibility to the major variables in the study were considered in the investigation.

The population for the study was sixth-grade children in the

Edmonton Separate School System in schools located in similar middle-class communities. A random selection of seventy-five subjects was made. Complete data were obtained for a final sample of thirty-four girls and thirty-eight boys.

The instruments used in the study included a multiple-choice reading comprehension test, a free response reading comprehension test, measures of language differentiation, two cognitive style tests, a measure of intelligence, and a measure of spontaneous flexibility.

Product-moment correlations were computed for all variables. In addition the language and intelligence variables which made significant contributions to the efficiency of predicting reading performance were determined through stepwise regression analysis. A factorial analysis process was employed to reduce the data to major dimensions. The 0.01 level of significance was used as the criterion for the correlational analysis. An analysis of the quality of response on the language tests indicated a degree of unity of verbal habit for proverb and vocabulary measures. Quality of response on a word association measure was not related to quality of response on proverb and vocabulary measures. Significant positive correlations were obtained between reading comprehension and conceptual responses on the language measures. A combination of language and IQ variables was significant for predicting scores for specific aspects of reading

comprehension. In no case was a WISC IQ score the "best" single predictor of reading achievement. Significant, but low correlations were obtained for the cognitive style, field independence, and reading.

The cognitive style, conceptual differentiation, showed no relation to reading and appears to represent a different aspect of differentiation from the language measures and the cognitive style of field dependence-independence. Thirteen factors were used to obtain stable communality estimates. Eight of the factors were tentatively identified.

Further investigations were suggested which relate to the components of language significant for reading, to an analysis of the reading process, and to further identification of individual consistencies in the cognitive behavior of children.

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CHAPTER I

THE PROBLEM

I. INTRODUCTION

Current theories of reading propose that proficient reading does not depend primarily on the visual component. Rather, "... it is in direct apprehensions of meaning that the skilled reader's performance must be understood" (Kolers 1970, p. 117). "Emphasis is upon direct perception of meanings and relations" (Kolers 1970, p. 109). Smith and Holmes (1971) note, "What distinguishes the skilled reader from the novice ... is not ... the amount of visual information that he can pack into a single fixation, but the amount of nonvisual information with which he can leaven the featural input and make it go the furthest " (p. 410). Smith's (1971) model of comprehension proposes that a fluent reader is able to identify meaning from the visual features without the mediation of word identification, provided he is able to make use of the syntactic and semantic redundancy that exists within sequences of words (p. 195). Goodman (1970) has formulated a model which proposes that, "At any point in time ... the reader has available to him and brings to his reading the sum total of his experience and his language and thought development" (p. 264). In a review of language models and reading Athey (1971)

has written: "Since reading is a product of both cognition and language, a clarification of the relationship between these two functions is necessary to understand the mental processes involved in reading" (p. 13).

Maturity versus immaturity of the conceptual or semantic system may be viewed as an aspect of language differentiation. Vygotsky (1962), in a discussion of the evolution of word meanings during childhood, states, "Word meanings are dynamic rather than static formations. They change as the child develops; they change also with the various ways in which thought functions" (p. 124). The process of differentiation of the child's language has been described by Lenneberg (1967), McNeill (1970a), and Ervin-Tripp (1966) among others.

That there is a cognitive basis to language acquisition has been stressed by Slobin (1970) and Cromer (1968). Slobin (1970) regards the learner as an active participant in learning:

> The important advances in language development ... seem tied to such variables as increasing ability to perform a number of operations in a short time, increasing short term memory span, and increasing cognition of the categories and processes of human experience (p. 184).

Cromer (1968), in discussing the role of cognitive abilities as determiners of linguistic change, has stated: "There is directed activity ... both in production and acquisition" (p. 168).

Lenneberg (1970), in an explanation of the development of language in children, has written:

> Everything in life, including behavior and language, is interaction of the individual with its milieu. But the milieu is not constant. The organism itself helps to shape it (this is true of the cells and organs as much as of animals and man). Thus, the organism and its environment is a dynamic system and, phylogenetically, developed as such (p. 19).

Successful and unsuccessful readers at the elementary level have demonstrated contrasting levels of language differentiation (e.g. Wickens, 1963). Several studies have shown that successful readers are able to treat the world more abstractly and gain some degree of detachment from the concrete present (e.g. Kress, 1956).

The basic assumptions of the cognitive-developmental orientation have been described by Mehrabrian (1968):

> ... the theorizing of Piaget and Werner emphasize the active-structuring relationship of an individual to his environment. This type of relationship is assumed to follow from the premise that experience, and consequently knowledge of experience, does not impinge upon an organism in an organized form. At any given point in cognitive development an individual is assumed to mould and shape incoming stimulation in terms of the cognitive categories available to him--whether or not these be explicitly known to him. In other words, any individual is assumed to subdivide his experience into various groupings (i.e. establish differentiations or make discriminations) and also to expect (i.e. predict) or intervene (i.e. exert controlling influence to obtain certain types of relationships between the discriminations he has made (p. 125).

Flavell and Wohlwill (1969), in a discussion of the criteria for a model of cognitive development, have written:

> The outcome of a cognitive encounter with the environment is never more than partly a function of what the subject knows and how that knowledge is represented and organized. It also depends upon his ability to deploy and maintain selective attention, to organize perceptual elements into intellectually suitable form ... and so on (p. 75).

Research in recent years on psychological individuality has shown that individuals demonstrate preferred ways of functioning in their perceptual and intellectual activities. These preferences, termed cognitive styles, have been identified as generalized, stable, individual consistencies in cognitive behavior and cognitive organization and functioning. Styles have been observed in the behavior of both adults and children. Witkin et al. (1962) have identified a dimension of cognitive style which they have termed field dependence-independence. Field independence, an analytical capacity, reflects the tendency to analyze the environment actively in contrast with functioning that is passive, global, and diffuse. In view of these characteristic approaches, this manner of cognitive functioning has also been referred to as the global-articulated dimension.

Witkin et al. (1962) hold that degree of field independence is one indication of psychological differentiation and have proposed an hypothesis of child development termed the "differentiation hypothesis":

> Specifically, the differentiation hypothesis proposes an association among the characteristics of greater or more limited differentiation, identified in the comparison of early and later functioning in each of several psychological areas: degree of articulation of experience of the world; degree of articulation of experience of the self, reflected particularly in the nature of the body concept and extent of development of a sense of separate identity; and extent of development of structured controls and defenses. Implicit in this hypothesis is the view that greater inner differentiation is associated with greater articulation of experience of the world (p. 16).

Witkin's findings have shown only a limited relation between mode of field approach and various kinds of verbal ability. However, Witkin et al. (1962) have suggested, "Particularly important is the development of tasks which would permit a specific evaluation of extent of articulation in the medium of language ..." (p. 202). Witkin et al. (1962) elaborate:

> An example is the extent to which the child has developed a speech medium which is relatively differentiated from the sphere of action and perception. As Werner, Piaget, and others have pointed out, language is first intimately fused with action and perception and only gradually becomes separated from the realm of concrete activity. ... Later on language is employed for the statement of relations among concepts and can be radically divorced from actual events (p. 202).

Witkin et al. (1962) comment further, "It would be our expectation that this particular aspect of linguistic functioning would be related to mode of field approach and other characteristics of developed differentiation" (p. 202).

Gardner et al. (1960) have defined a cognitive control, conceptual differentiation, which is relevant to the degree of differentiation adults and children impose in the spontaneous categorization of arrays of heterogeneous objects, persons and events. Some individuals consistently arrange their experiences in many small categories while others show consistent preferences for large categories containing many events. In a discussion of the significance of conceptual differentiation, Gardner (1966) noted:

> Every act of perception (at least following the earliest phases of cognitive development) implicates a categorizing process. This is as true of internal as of external perception. In the course of experiencing ourselves in interaction with the external world, we also produce, even in early childhood, elaborate, hierarchical arrangements of concepts that organize our memories in ways amenable to economical conceptual activity in subsequent thinking. The act of categorization, and individual styles of categorization, are therefore of critical importance to thought functioning (p. 144).

Gardner and his colleagues have not found a significant relation between conceptual differentiation and verbal ability. Although experimental evidence concerning the relation of concept development to reading is still meager, trends are significant (e.g., Jay, 1950; Braun, 1963) and warrant investigation of reading comprehension in terms of conceptual differentiation.

The emphasis on active-individual interactions in the processing of language in reading, and the significance of individual dimensions of cognitive styles in cognitive functioning are basic to the present study.

II. PURPOSE OF THE STUDY

The purpose of the study was to explore the nature of the relations among reading, selected measures of language, and the cognitive styles of field dependence-independence and conceptual differentiation.

Specifically, the questions investigated were:

1. To what extent is unity of verbal habit demonstrated in measures of language performance when these measures are analyzed in terms of language differentiation?
2. Are the qualitative patterns of responses to selected measures of language differentiation significantly related to performance on measures of reading comprehension?
3. What are the relations between individual differences in cognitive style and variations in performance in reading and language?

III. DEFINITION OF TERMS

For the purpose of this study the meanings to be attached to certain terms are as follows:

Conceptual differentiation refers to the degree of differentiation subjects impose in the process of categorizing pictures of heterogeneous objects.

Differentiation refers, generally, to the complexity of a system's structure. A less differentiated system is in a relatively simple structural state; a more differentiated system is in a relatively complex structural state.

Field dependence is the inability to overcome the influence of an embedding field, or the tendency to allow the influence of the field to dominate perception.

Field independence refers to the ability to perceive an item as discrete from an organized field when the field is structured, and to impose structure on a field that is not inherently organized.

Cognitive style refers to an enduring, self-consistent mode of behavior that distinguishes a person's cognitive functioning.

Language differentiation refers to the extent to which language in children is separated from the sphere of action and perception.

In research based on psychoanalytic theory, principles of cognitive organization are conceptualized as cognitive controls, while the individual's over-all patterning of controls is designated as cognitive style. In the present study the terms cognitive style and cognitive control are synonymous and refer to individual modes of cognitive organization.

IV. DESIGN OF THE STUDY

Population and Sample

The population for the study was sixth grade children in the Edmonton Separate School System in schools located in similar middle class communities. Children whose medical records showed histories of visual or auditory anomalies, or who had repeated grades, were excluded from the study. Schools of a homogeneous community background were identified by the Supervisory Staff, Elementary Division, Edmonton Separate Schools. A random selection of twelve grade six classes was made from the total number of grade six classes in the schools identified through this procedure. All pupils in the sample were tested on a reading comprehension test. Raw scores were tabulated and the extremes of the

distribution eliminated from the sample. Following these steps, a random selection of seventy-five pupils was made. These subjects were screened for word recognition. Any subject not meeting the conditions of the word recognition test was excluded from the sample, and another subject selected randomly to take his place. Further tests were then administered including a reading test, two cognitive style tests, a measure of intelligence, two language measures and a measure of spontaneous flexibility. The tests employed in the study, with the exception of the reading test and the test of spontaneous flexibility, were administered individually to the students.

V. RESEARCH HYPOTHESES

The following hypotheses were tested:

1. Measures of language differentiation will be significantly interrelated, i.e., unity of verbal habit will be demonstrated in measures of language performance.
2. A significant relation will be found between reading comprehension and indices of language differentiation.
3. The tendency to give abstract responses on measures of language differentiation will be significantly related to cognitive style.
4. A significant relation will be found between reading comprehension

and the cognitive styles of field dependence-independence and conceptual differentiation.

Since other studies have investigated the relevance of the factors of sex, intelligence, and spontaneous flexibility (the divergent production of class ideas) to one or more of the major variables in this study, sample characteristics on those factors were considered in the present investigation.

VI. ANALYSIS OF THE DATA

Data were processed at the Computing Center, University of Alberta, on the DERS* program. A correlation analysis of all variables was carried out and the patterning of intercorrelations was determined for separate tests, for the blocks of reading data, language data, and cognitive style data, and across all tests. Means and standard deviations of all scores were compared for boys versus girls. Stepwise multiple regression analyses were used to determine the language variables which best predicted performance on the measures of reading. The data were reduced to major dimensions by factor analysis.

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*Division of Educational Research Services, The University of Alberta.

VII. LIMITATIONS

The findings of the study can be generalized only to the population studied or to similar populations.

The findings can be related only to the particular cognitive styles investigated.

The study of language development is limited to the tasks chosen by the investigator.

VIII. SIGNIFICANCE

The emphasis on learning to read in school may be placed within the larger context of the emphasis on verbal skills. Academic achievement is determined largely by verbal ability. At the upper elementary level the problem of meaning takes precedence over decoding in reading and the conceptual aspect of reading becomes increasingly significant. In recent years cognitive styles have been regarded as important aspects of individuality. Some definitions of the relationships among reading, language, and cognitive style may have implications for a definition of the reading process, and may indicate some of the reasons for the differences in cognitive products and cognitive performance of children.

The problem of interindividual differences is one which is receiving direct attention in education today. Inasmuch as the identification

of consistent individual differences in behavior has a direct bearing on practice, the identification of tendencies of cognitive style may have implications for diversification and decision making in education. Should particular styles be advantageous or disadvantageous to learning, the results may have some implications for intervention.

The results should allow for some suggestions concerning the relations between language differentiation and other aspects of differentiation. In addition the study should allow for an exploration of the relations between particular cognitive styles in children.

IX. THE ORGANIZATION OF THE STUDY

The study has been organized according to the following divisions. Chapter II presents a review of the theoretical conceptions which guided the study. Chapter III presents a review of the literature. The design of the study and the measurement methods employed are described in Chapter IV. Chapter V reports the findings of the study and the interpretation of the results. The conclusions and implications of the study are presented in Chapter VI.

CHAPTER II

THEORETICAL BACKGROUND

The theoretical considerations which served as a basis for the study are considered in this chapter. Some views of the nature of cognitive development, language differentiation, and reading, drawn from various disciplines, are examined. Several theories which have implications for individuality of cognitive functioning in children are discussed.

I. COGNITIVE DEVELOPMENT

Cognitive-developmental approaches assume that the individual, in his interaction with the environment, acts as "an active and structuring agent" (Mehrabian, 1968). Moreover, the individual's response to environmental stimuli is partly determined by his cognitive construction of the environment. The theory of man as an active agent has been reviewed by Langer (1969) in his discussion of a developmental perspective which he terms "the organic lamp theory." The central focus of organic lamp theory is "the organism's construction of its own rational systems of action" (Langer, 1969, vii). Langer states, "At the heart of this view is the ontogenetic thesis that man develops to be what he makes

himself by his own actions (1969, p. 7). Further, Langer (1969) indicates:

> Because humans spontaneously initiate their actions, they play a constructive role in their own psychological experience and development. Formally, they are organizations of organs or systems of action that operate (1) to interact with their environment and (2) to construct their own experience and knowledge of themselves and the world. Genetically they are endowed with (a) the necessary systems for initial interaction with the milieu in personally meaningful ways and (b) the self-generative characteristics that ensure their own development and self-actualization (p. 87).

Development may be characterized as an orthogenetic process (e.g., Werner, 1961) or as an equilibration process (e.g., Piaget, 1967, 1970).

Differentiation

It is assumed that human development proceeds from lesser to greater differentiation and hierarchic integration. Differentiation is a dimension of development that has been described in both biology and psychology. Coghill's (1929) research on the development of the behavior patterns of salamanders is an important source of the concept. Baldwin (1967, p. 115) has noted, however, that the concept of differentiation has never been entirely clear. Kagan and Kogan (1970, p. 1278) have also commented on the conceptual ambiguity of the construct, noting that the term has been used in different ways

in different theoretical systems.

Thompson and Grusec (1970) indicate that differentiation "refers, generally, to the transition from a relatively unitary system to one with independent parts" (p. 571). Differentiation at the physiological level has been defined but at the behavioral level the concept is somewhat more obscure. Thompson and Grusec (1970) state: "At the physiological and morphological levels, we find occurring with age such processes as histogenesis, regionalization, and morphogenesis, whereby qualitative differences in form, structure, and function start to become apparent" (p. 471). Differentiation at the behavioral level is described as follows: "On the input side, we may think of it as having to do with the improvement in discriminative ability that occurs with increasing age up to and perhaps beyond maturity" (Thompson and Grusec, p. 571). Further, "As with input systems, it is likely that differentiation on the output side may follow a two-stage development, the first being concerned with the laying down of basic skills, the second with the learning of the more refined and complex coordinations often demanded of adults" (Thompson and Grusec, 1970, p. 572). Thompson (1966, 1968) has applied differentiation to a model in which learning is regarded as an S-R bond. He has postulated three types of learning according to age

level: (1) at a very young age, undifferentiated input--undifferentiated output; (2) at a later age, differentiated input--undifferentiated output; and (3) later, differentiated input--differentiated output.

Kagan and Kogan (1970) comment that differentiation and hierarchic integration are "fundamental to almost all theories of cognitive development" (p. 1278). They refer to the following theoretical systems:

> Cognitive structures in the course of development become more differentiated and hierarchically integrated, according to Lewin (e.g., 1935, 1951), Piaget (e.g., 1952, 1954), and Werner (e.g., 1948, 1957). A similar theme can be detected in the work of Harvey, Hunt and Schroder (1961), Birch and Lefford (1967), and Bruner, Olver, and Greenfield (1966). However, since the concepts in question are embedded within the particular theoretical systems of the authors cited, argument among them regarding the meaning of differentiation and hierarchic integration may be more apparent than real (p. 1278).

Decentering

The transition from an undifferentiated to a differentiated state in the child involves a process of decentration. Decentering is defined by Kagan and Kogan (1970) as "the ability to shift or decenter from one aspect of a situation to another, an ability that emerges when abstract conceptual thought has gained ascendancy over sensory and perceptual processes in the child's commerce with the environment"

(p. 1289). Within Piaget's system the transition from action to thought involves a process of decentration. Decentering occurs first at the sensory-motor level and then later at the level of thought. Piaget and Inhelder (1969) describe decentering at the level of action as "the transition from an initial state in which everything is centered on the child's own body and actions to a 'decentered state' in which body and actions assume their objective relations" (p. 94). At the level of thought:

> Representative intelligence begins with the child's systematic concentration on his own action and on the momentary figurative aspects of the segments of reality with which this action deals. Later it arrives at a decentering based on the general coordination of action, and this permits the formation of operatory systems of transformations and constants or conservations which liberate the representation of reality from its deceptive figurative appearance" (p. 128).

Piaget (1970) further describes the development of stable equilibrium between assimilation and accommodation in terms of centration and decentration:

> .... the gradually emerging equilibrium between assimilation and accommodation is the result of successive decentrations, which make it possible for the subject to take the points of view of other subjects or objects themselves. We formerly described this process merely in terms of egocentrism and socialization. But it is far more general and fundamental to knowledge in all its forms. For cognitive process

> is not only assimilation of information; it entails a systematic decentration process which is a necessary condition of objectivity itself (p. 710).

Psychological Differentiation and Field Dependence-Independence

Witkin extended his early work on field-dependence to a study of psychological differentiation: "We now believe that a field-dependent or field-independent way of perceiving is one of a large constellation of interrelated characteristics which together reflect on individual's level of differentiation" Witkin et al. (p. 24). Style of experiencing is a central characteristic of psychological differentiation. The field-dependence-independence dimension serves as a "tracer element" in identifying level of psychological differentiation. Witkin et al. (1962) define differentiation in broad terms as "the complexity of a system's structure" (p. 9). "A less differentiated system is in a relatively homogeneous structural state; a more differentiated system in a relatively heterogeneous state" (p. 9). A major characteristic of a highly differentiated state is specialization of functioning in which subsystems present within the general system mediate specific functions. For the psychological system this means separation of psychological areas, as well as specificity of functioning within an area. Some manifestations of high psychological

differentiation include specific reactions to specific stimuli, versus diffuse reactions to any of a number of stimuli; the channeling of impulses versus "a spilling over"; the discrimination of parts of a visual field versus fusion of parts with their background; the separation of feelings and needs into more or less discrete states; and separation of the self from the surrounding field. Witkin points out that separation of self from the environment makes possible greater determination of functioning from within, as opposed to a more or less enforced reliance on external nurturance and support for maintenance, typical of the relatively undifferentiated state. Integration refers particularly "to the form of the functional relationships among system components and so speaks first of all on the patterning of the total system," and also to "the form of the relationship between the system and its surroundings." Witkin distinguishes between complexity of integration and effectiveness of integration. Integration is effective when "there is a more or less harmonious working together of system components with its environment, thereby contributing to the adaptation of the organism." Complex integration means that "the relationship among system components and between the system and its environment are elaborate" (Witkin et al 1962, p. 10). Inasmuch as more complex relationships may be obtained in a highly specialized system, complex integration may be considered

a function of level of differentiation. Both effective and ineffective integration are possible at any level of differentiation. Witkin has postulated several indicators of a more differentiated or less differentiated psychological state. These include: degree of articulation of experience of the world; a developed sense of self as separate from the outer world and the development of a "sense of separate identity"; the formation of specialized controls and defenses. The growth of a differentiated self is viewed as part of a process of articulation of experience. Initially experience of body-field matrix is global and during development becomes progressively more articulated so that body, self, and objects in general are experienced as segregated. Articulated experience is experience that is analyzed and structured, rather than global. In this context the term "structuring" refers to the imposition of organization on a field, internal or external, and the term "structured" to the outcome of the process. The term "global" describes experience in contrast to each of the following: analytical, structured, articulated.

> The person who experiences in an articulate fashion has the ability to perceive items as discrete from their backgrounds or to reorganize a field, when the field is organized; and to impose structure on a field, and so perceive it as organized, when the field has relatively little inherent structure" (Witkin et al. 1962, p. 14).

Witkin holds that the concept of increasing articulation may be applied to experience of symbolic material as well as to experience of an immediately present stimulus configuration. Differences in the development of differentiation may be attributed to variations in constitutional characteristics and to particular life circumsiances, such as family experiences. Children become more differentiated as they grow older. However, inasmuch as development is stable it is expected that the child who shows greater differentiation than his peers at one stage of development will show it at later stages as well.

Conceptual Differentiation

Concept formation may be characterized by wide ranges of differences in categorizing style. Analyses of conceptual behavior by Gardner and his co-workers (e.g., Gardner and Schoen, 1962; Gardner and Moriarty, 1968) have demonstrated that the categorizing behavior of adults and children is distinguished by individual differences in the degree of "conceptual differentiation" imposed upon arrays of heterogeneous objects, persons, and events. Subjects high in conceptual differentiation (subjects with "narrow" equivalence range) tend to form many small groups in an object sorting task. Subjects low in conceptual differentiation (subjects with broad equivalence range) prefer to group

objects into a few broad categories. In the research of Gardner and his associates, level of conceptual differentiation represents but one of the stable aspects of an individual's concept formation. Gardner and Schoen (1962, p. 3) hypothesize that spontaneous conceptual differentiation, preferred level of abstraction, and capacity for abstraction are distinguishable dimensions of concept formation. They differ with Harvey, Hunt and Schroder (1961), "who seem to assume that capacity to abstract is a unitary phenomenon of vast generality in the determination of cognitive behaviors" (Gardner and Schoen, 1962, p. 4). The assertion that conceptual differentiation, preferred level of abstraction, and capacity for abstraction are "distinctly different" is examined by Pikas (1966) who suggests that the evidence for the distinction seems "not to be satisfactory" (p. 97). A study by Gardner and Moriarty (1968) indicates that conceptual differentiation and field-dependence-independence represent different kinds of differentiation. Gardner and Moriarty (1968) note that "whereas the kind of differentiation represented by response to field-articulation increases from preadolescence to adulthood ..., spontaneous differentiation in concept formation moves in the opposite direction, i.e., toward less differentiation with increasing age" (p. 86). Their findings suggest that the progression for conceptual differentiation is "from emphasis upon differences in objects to synthesis in terms of similarities" (p. 86).

Inasmuch as conceptual differentiation accounts for an aspect of individual differences in concept formation the variable was considered relevant for the present study.

II. COGNITIVE THEORIES

The following section is concerned with concepts from particular theoretical systems. It focuses upon specific constructs which relate to individuality in cognitive performance in children and upon developing processes.

Piaget's Theory of Intellectual Development

According to Piaget "...in order to know objects, the subject must act upon them; he must displace, connect, combine, take apart, and reassemble them" (1970, p. 704). "Knowledge, then at its origin, neither arises from objects, nor from the subject, but from interactions--at first inextricable--between the subject and those objects" (1970, p. 704). In Piagetian theory the process is described as an adaptive relationship. Adaptation is the process whereby "the organism establishes and maintains an internal equilibrium through active interchange with the environment" (Wolff, 1960, p. 11). Piaget (1967) has written:

> The psychological development that starts at birth and terminates in adulthood is comparable to organic growth. Like the latter, it consists essentially of activity directed toward equilibrium. Just as the body evolves toward a relatively stable level characterized by the completion of the growth process and by organ maturity, so mental life can be conceived as evolving toward a final form of equilibrium represented by the adult mind. In a sense, development is a progressive equilibration from a lesser to a higher state of equilibrium (p. 3).

Adaptation is characterized by the complementary processes of assimilation and accommodation. Assimilation involves the incorporation of environmental events into existing structures. The process of accommodation describes the modification of response to the environment. The ratio of accommodation and assimilation present in activity may vary from extreme assimilation, to a state of equilibrium to extreme accommodation. Types of equilibrium vary with levels of development and with problems that must be solved in interaction with the environment. A second idea central to Piaget's theory is that of construction which involves the coordination and integration of structures. Wolff states: "This tendency toward integration is an expression of the organizing function of all mental activity, seeking to establish the highest degree of equilibrium among the various schemata which is possible at any state of development (1960, p. 27).

Piaget (1967, pp. 5, 6,; 1970, pp. 710 - 711) distinguishes six stages of development according to which structures are built. These stages appear in a fixed order of succession, each one being necessary for the development of the following one:

> 1. The reflex or hereditary stage, at which the first instinctual or nutritional drives and the first emotions appear.
>
> 2. The stage of the first motor habits and of the first organized percepts, as well as of the first differentiated emotions.
>
> 3. The stage of sensorimotor or practical intelligence (prior to language), or elementary affective organization, and of the first external affective fixations. These first three stages constitute the infancy period--from birth till the age of one and a half to two years--i.e., the period prior to the development of language and thought as such.
>
> 4. The stage of intentive intelligence, of spontaneous interpersonal feelings, and of social relationships in which the child is subordinate to the adult (ages two to seven years, or "early childhood").
>
> 5. The stage of concrete intellectual operations (the beginning of logic) and of moral and social feelings of cooperation (ages seven to eleven or twelve, or "middle childhood").
>
> 6. The stage of abstract intellectual operations, of the formation of the personality, and of affective and intellectual entry into the society of adults (adolescence) (Piaget, 1967, p. 6).

In terms of principal periods of development, three periods may be considered: (1) a sensori-motor period (birth to 1-1/2 years of age); (2) a period of representative intelligence consisting of (a) a preoperational sub-period (beginning at 1-1/2 years to 2 years of age) and (b) a sub-period of concrete operations (at about 7 to 8 years); and (3) the period of propositional or formal operations consisting of (a) a sub-period of organization (11 to 13 years of age) followed by (b) a sub-period of achievement.

Language emerges at the end of the sensori-motor period.

Werner's Concept of Mental Development

Werner (1957, 1961) formulated a concept of mental development based on the biological principle of orthogenesis. Werner considered this principle to be the fundamental law of development. The orthogenetic law states:

> Whenever development occurs, it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation articulation, and hierarchic integration (Werner, 1957, p. 126).

The essence of development is "the steadily increasing differentiation and centralization or hierarchic integration, within the genetic totality" (Werner, 1961, p. 53).

Werner gradually extended this theory so that it encompassed not only the growth trends of individual development, but also other aspects of mental evolution, e.g., studies in the culture over time, the microgenesis of thought.

As pointed out by Witkin (1965a):

> Werner saw his general developmental principles as applicable to all areas of the life sciences. Wherever there is life there is growth and development, that is formation in terms of a systematic, orderly sequence of progression and regression. Development may be observed in the phenomena of orthogenesis, phylogenesis, psychopothology, and ethnopsychology. It may also be observed in the interplay of levels of functioning contemporaneously present in the mature organism--full consciousness, reverie states dreams. It may be observed as well in psychological processes taking place over very brief spans of time--that is microgenetically (p. 313).

In an elaboration of Werner's treatment of development, Wapner (1964, p. 14) has written: "Development is not defined in terms of time but rather in terms of a progression of stages of a system which is undergoing transition. Thus, it is a manner of ordering data which is not restricted to age changes alone." A further elaboration has been provided by Kaplan (1967). The dialetical nature of this development has been discussed by Werner and Kaplan (1963) and by Kaplan (1967). "There is on one hand, the tendency of organisms to conserve their integrity, whether biological or psychological .... There is on the other hand,

the tendency of organisms to develop towards a relatively mature state" (Werner and Kaplan, 1963, p. 5), or as expressed by Kaplan (1967, p. 84), a tendency toward "fragmentation, partition, separation, division, multiplicity" versus a countervailing tendency toward "wholeness, constancy, synthesis, identity, and unity." Concepts basic to the orthogenetic principle are: (1) Continuity versus discontinuity of development. The forms and processes underlying increase in differentiation and integration undergo two main kinds of changes: (a) quantitative changes which are either gradual or abrupt, and (b) qualitative changes which are discontinuous (Werner, 1957, p. 137). (2) Uniformity versus multiformity of development. "The workings of the orthogenetic law as a uniform, regulative principle have to be specified through the ordering and interpretation of the multiform operations" (Werner, 1957, p. 132). Thus, for example, overt achievement is not necessarily a true indication of the developmental stage, (3) Uniliniarity versus multilinearity of development. "The orthogenetic law, by its very nature, is an expression of unilinearity of development" (Werner, 1957, p. 137). At the same time, there exists a multiplicity of actual developmental forms or individual variations. (4) Fixity versus mobility of developmental levels. An individual, depending on the situation, may perform at

genetically different levels. Operations may be defined in terms of horizontal differentiation. In addition, the more mature person compared with the less mature person has available a greater number of developmentally different operations (Werner, 1957, p. 138). Performance may be defined in terms of "vertical" differentiation.

Werner (1961) has provided the following sets of conceptual opposites for the description of the genetic level of mental organization: (1) syncretic-discrete; (2) diffuse-articulated; (3) indefinite-definite; (4) rigid-flexible; (5) labile-stable. These opposites "imply a certain developmental direction, a movement which may be described as in the direction of increasing differentiation" (1961, p. 55). The terms syncretic-discrete refer to a functional analysis of development. Syncretic functioning refers to a merging of "acts and meanings" which in a more mature state are discrete. It is characterized by a degree of undifferentiatedness between subject and object, by action bound to the concrete situation, by interaction that is immediate rather than separated by devices of mediation, by concrete and affective thinking, by the fusion of names with objects they denote. Differentiation of formal structures is described in terms of diffuse versus articulated development. A diffuse structure is characterized by homogeneity and uniformity of parts. Articulation refers

to a formal construction in which the parts are distinct yet marked by a hierarchic integration and coordination among the parts integrated with the whole. Diffuse activity is characteristic of the behavior of the newborn infant. Differentiation, for the infant, would lead from a global "mass activity" to individuation of generalized response, and from a lack of coordination among the different parts of the total movement to hierarchic integration of response. The genetic transformation of the diffuse into the articulated occurs as "a dividing up, a progressive disjunction, of the whole into related parts" (Werner, 1961, p. 54). Two pairs of terms, flexible-rigid, and labile-stable are considered to be dynamic properties of mental development. The more undifferentiated a system, the more rigid and less stable will the functioning be. Rigidity in the child's behavior is evident in his tendency to carry out an activity according to an exact pattern, in difficulty in synthesizing two activities learned singly, in global "all or nothing" reactions. Lability refers to inconstancy of meaning. It is evident in the inconsistency of the young child's causal meaning, i.e., conceptual connections between diverse contents change in accordance with the child's transitory state of apprehension while explanations are variable centered. It also appears in the child's personality in the lack of constancy in ego-content, in the ease with which he can assume

different roles in play, in enduring imaginary transformations of the personality--where the child identifies himself as another person, and in creation of an imaginary companion. Lability also appears in the child's perceptions of others. The objective person does not make an enduring impression on the child, and only a few individuals have a constancy of significance.

A second aspect of Werner's research stems from his orientation as an organismic psychologist. Two assumptions concerning behavior are basic to the organismic approach:

> 1. The Holistic Assumption. Any local organ or activity is dependent upon the context, field, or whole of which it is a constitutive part: its properties and functional significance are, in large measure, determined by this larger whole or context.
>
> 2. The Directiveness Assumption. It is assumed that the various organs or activities of an organism function in the realization of ends imminent in the activity of the organism as a whole (Werner and Kaplan, 1963, p. 3).

Werner and Kaplan (1963) have combined the developmental and organismic orientations into a unitary organismic-developmental framework. Within this framework they identify developmental shifts in individual-environment interactions:

1. Tropistic-reflex actions to stimuli;
2. Goal-directed sensori motor action upon signaled things; and

3. Contemplative knowledge about objects.

In the process of development, lower stages become subordinated to and integrated within the higher levels. "The organism becomes increasingly sovereign in initiating and determining the character of its own actions; and it increasingly molds or constructs even the context of the scenes to suit its own needs and goals" (Langer, 1970, p. 743). The increasing freedom of "action upon things" involves genetic changes in the ends toward which the organism is directed. The final stage involves a "basic directiveness toward knowing." Werner and Kaplan (1963. p. 11) hold that the symbol is formed within this latter context.

Man primarily passes through the two most advanced stages postulated. Werner has provided a developmental characterization of these stages in terms of sensorimotor, perceptual, and conceptual development. Language may be viewed as developing within this framework.

Bruner's Theory of Cognitive Growth

As pointed out by Kagan and Kogan (1970, p. 1278) a similar theme is found in the work of Bruner. Bruner (1966a) refers to three ways in which a person "knows" something: through doing it--enactive representation; (2) through a picture or image of it--ikonic representation; and (3) through some symbolic means such as language--symbolic

representation. The three representational systems are parallel. Each is also unique but the sytems are parallel. Each is also unique but the systems are capable of partial translation one into the other. In this translation Bruner sees an "impulsion" to cognitive growth:

> For there is serious disequilibrium when two systems of representation do not correspond--what one sees with how one says it, or how one must act covertly and how the world appears ... it is usually when systems of representation come into conflict or contradiction that the child makes sharp revisions in his way of solving problems ... (1966a, p. 11).

The child comes initially to know objects through enactive representation. However, he is unable to discriminate clearly between stimulus and response and objects are defined mainly in terms of the actions which they evoke. Bruner (1966a) suggests that "there is doubtless a whole range of factors affecting the gradual loosening of the world of perception and imagery from the world of action" (p. 21).

The child's perceptual behavior holds clues to his early ikonic representation, e.g., perceptual life contains a strong motoric component; it is subject to distortion through affect; it is egocentric and unstable. Bruner (1966a) writes:

> It is as if the young child, having achieved a perceptual world that is no longer directly linked to action now deals with the surface of things that catch attention rather than with the deeper structures based on invariant fixtures (p. 26).

However, by the time ikonic representation is established the separation between the self and what is external is relatively clear. The child at this stage employs ostensive definition in his thinking. He relates something in his mind to something he is encountering by indicating a particular sensory correspondence between the two, i.e., "match by direct correspondence" (p. 29).

Growth culminates in the transition to the third mode of knowing, symbolic representation. Bruner (1966b) holds that symbolic activity finds "its first and fullest expression" (p. 44) in language.

Lewin's Theory of Cognitive Structure

In Lewinian theory the psychological environment is a description of the external situation as it affects behavior. Behavior represents a change in the psychological environment as the psychological structure reacts to the pressure of its own internal dynamics. Leeper (1943) points out: "Lewin ... is convinced that behavior must be related, not merely to inner needs, but also to the total situation as organized or structured by the organism" (p. 28). Cognitive structure, according to Lewin, is the arrangement of regions in the psychological environment.

The person is described by Lewin (1936) as "a highly differentiated object" (p. 166). Lewin distinguished within the person "a multitude of

different regions whose changes of state are to a certain extent independent of each other" (1936, p. 167). The structures of the person of the adult and the person of the child show considerable individual differences. The structures of the child, for example, is less differentiated into part regions, i.e., "the degree of wholeness ... is greater with the child than with the adult" (1936, p. 183).

Lewin (1951) postulated two aspects of differentiation in the development of the person: (1) an increase in the number or variety of regions, and (2) a decrease in the interdependence of regions. The variety of regions refers to the growing variety of behavior expressed in the domain of skills, emotions, etc. (Kagan and Kogan, 1970). Concerning the second aspect of differentiation, Lewin (1936, p. 187) wrote:

> Individuals differ not only in the degree of differentiation of the whole person but also in the way in which the different part regions are arranged, in the strength of the connections between the individual part regions, and the function which they have in the life of the person (1936, p. 187).

Kagan and Kogan (1970) point out that two contemporary research traditions reflect the Lewinian distinction between the two aspects of differentiation. The "variety of regions" concept is considered a forebear of cognitive social cognition [e.g., Kelly's (1955) psychology of personal constructs and Bieri's (e.g., 1961) work on cognitive complexity] and as one influence

on the research on the cognition of similarities and differences between objects and concepts in the physical world (e.g., Bruner, Olver and Greenfield, 1966; Kagan, Moss and Sigel, 1963). The influence of the conceptualization, independence of parts, is reflected in the research program conducted by Witkin and his associates.

III. LANGUAGE

Houston (1971) applied a classification scheme developed by Ausubel (1957) to an analysis of theoretical positions on the acquisition and use of language. The theories are classified in terms of their views on the relationship between heredity and environment in development. Four positions were considered: behaviorist, cultural relativist-determinist, interactionist, and preformationist-predeterminist.

As the focus in the present study is mainly on language as an "interactive phenomenon" (Houston, 1971, p. 257), characteristics of the interactionist approach are examined. Houston (1971) notes that:

> ... the interactionists see language merely as a medium of representation which is influenced throughout the child's growth by his overall capacities for thought and logic, his perception of the environment and others in it, and significantly, his perception of himself vis-a-vis others (p. 267).

Representative theorists of the interaction position are Piaget, Vygotsky, and Bruner. Significant aspects of the interactionist theory include the following positions:

General Characteristics

1. Developmental orientation
2. Rooted in European psychological and developmental thought.
3. Concern with development of perceptions and relation between language and cognition. Growth and development take place through organism's adaptation to environment and organization of conceptual schemes. Language part of general scheme of human development.
4. Continuous interaction between hereditary structure of organism and input from environment.
5. Concern with linguistic ontogeny. Language develops as child passes through endogenously motivated stages. Language develops along with capacity for logical thought.
6. Belief that language and thought influence each other (Houston, 1971, pp. 276 - 277)

Positions on Specific Questions

1. Language acquired because of biological predisposition to language.
2. Language defined in terms of conceptual and perceptual framework. Form of behavior. Internalized system.
3. Language described in terms of linguistic ontogeny. Note utterances characteristic of each developmental stage and type of cognition implied. Language the means by which concepts of space, time and causality are expressed.
4. Language a species--specific behavior. Come from intellectual character of humans.
5. Are universals in language development. All children use language about the same way. Children learn language about the same ages.
6. Several views: Piaget: Speaker has total conceptual system developed with, inseparable from rest of behavior. Linguistic competence integrated with cognitive process. Bruner: Separate linguistic competence in complex hierarchical system (Houston, 1971, pp. 280-281).

Language and Thought

Luria and Yudovich (1959) postulate:

> The acquisition of a language system involves a reorganization of the child's basic mental processes; the word thus becomes a tremendous mental factor which forms mental acitivty, perfecting the reflection of reality and creating new forms of attention, of memory and imagination, of thought and action (p. 12).

Ausubel (1966, p. 165) remarks that the choice of a particular arbitrary symbol to represent a new concept is not the only role of language in concept attainment:

> Verbalization does more than just attach a symbolic handle to a concept so that we can record, verify, classify, and communicate it more readily. It constitutes rather, an integral part of the very process of concept attainment itself; its generic properties and unique manipulability and transformability influence both the nature and product of the cognitive processes involved in acquiring concepts. Thus, when an individual uses language to acquire a concept, he is not merely labeling a newly learned generic idea; he is also using it in the process of concept attainment to acquire a concept that transcends by far--in clarity, precision, abstraction, and generality--the level of concept acquisition that can be achieved without language (p. 165).

In Piagetian theory language does not precede thought but rather is an aspect of a symbolic function "which is broader than language and encompasses both the system of verbal signs and that of symbols in the

strict sense" (Piaget, 1967, p. 91). Thus, language extends the power of concrete operations but is not the source of the operations which arise, rather, from action. Again, language is a necessary, but not a sufficient condition for the formation of propositional operations. They are bound to concrete operational structures. Piaget writes of an orientation "much more in the direction of an interaction between linguistic mechanisms and the subadjacent operational mechanisms than in the direction of linguistic determinism" (1967, p. 97). Piaget (1967, p. 98) points out however, "it is also evident that the more the structures of thought are defined, the more language is necessary for the achievement of this elaboration." Piaget (1967) concludes:

> Language is thus a necessary but not a sufficient condition for the construction of logical operations. It is necessary because without the system of symbolic expression which constitutes language the operations would remain at the stage of successive actions without ever being integrated into a simultaneous systems or simultaneously encompassing a set of interdependent transformations. Without language the operations would remain personal and would consequently not be regulated by interpersonal exchange and cooperation.... Thus language and thought are linked in a genetic circle where each necessarily leans on the other in interdependent formation and continuous reciprocal action (p. 98).

Evidence of the role of conceptual development in determining the language of the child is provided by Cromer (1968). Cromer noted

the increasing ability of the child to express events out of chronological order and to make statements about possibility. He hypothesized that the observed linguistic changes are due to a single factor:

> The development of a new cognitive ability leads the child to an active search for new forms to express the relations he is attempting to formulate. His acquisition from the surrounding "inputs" will not be a passive one. He will be actively directing his linguistic attention into a search for a heightened awareness of particular forms or structures used by adult speakers to express those newly understood relationships (p. 168).

Another claim for a cognitive basis to language acquisition is made by Schlesinger (1971) who writes that linguistic structures are" ... determined by the innate cognitive power of the child" (p. 70).

Sachs (1971) has commented:

> The development of the conceptual, or semantic system is another aspect of language change. Not only does the child begin with a grammar that is very different from the adult's; his whole system of structuring the world is different. The child must learn or invent all the categories and distinctions that he will eventually make as an adult member of his culture.
>
> Though research in this interesting problem has begun only recently, the emerging pattern of results suggests that there is a complex interaction between conceptual development and language development (p. 391).

Language Differentiation

"The infant's first emerging patterns of language acquisition are global, undifferentiated aspects which gradually unfold until the fully differentiated rules, lexical items, and phonological skills are established" (Lenneberg, 1967, p. 208). The emergence of syntax, phonology, and semantics in the child have been traced by Ervin and Miller (1963), Ervin-Tripp (1966) and McNeill (1970b), among others. The growth of language, within a cognitive context, has been discussed by Bruner (1966b). Current research on language development has also been examined by Sachs (1971) and by Kaplan and Kaplan (1971).

The literature on the evolvement of the semantic system indicates that children possess some kind of semantic system very early in development (McNeill, 1970b). From a consideration of the development of communication functions, Kaplan and Kaplan (1971) infer a possible semantic organization in the prelinguistic child.

The meaning of early utterances is fluid, as for example, any motor vehicle may initially be labelled "car." Lenneberg (1967) has noted, "Stimulus generalization is prior to stimulus discrimination." However, gradually more and more distinct semantic groups emerge until full

vocabulary is established. Words, according to Lenneberg (1967, p. 334) are labels for the categorization processes. Because the categorization process is dynamic the development of word meaning is possible. Vocabulary increase is due to three processes: (1) increases in the number of items known, (2) differentiation of categories and, (3) greater complexity in hierarchical and relational structures of knowledge (Ervin-Tripp, 1966).

The preschool child responds to the sound of words rather than to the meaning (Reiss, 1946). By age eleven children respond to relations of meaning such as antonymy; and by age fourteen synomyms elicit the strongest generalizations. Rhymes and alliterations decrease remarkedly with age. In contrast to adult vocabularies, children's nouns tend to refer more often to picturable items, to items with characteristic sizes and visual contours. Their verbs, more often refer to animal movements (Brown, 1958; Ervin-Tripp, 1966). Adults use more words superordinate to common children's words. Development in the word associations of children indicate a change with age from a predominance of syntagmatic to paradigmatic associations.

Studies designed to show children's concepts of space, time, causality, and other similar concepts throw further light on linguistic

development. These findings have been summarized in analyses of children's concept formation. Language maturation reflects growth from subjective to objective thought, from concrete to abstract cognitive operations, and from a simple to a complex categorization of experience.

The Genevan view on language development has been elaborated by Sinclair (1970):

> .... the Genevan psycholinguists believe that the child's competency in producing and understanding speech proceeds basically according to the Piagetian model of cognitive development: through complex interaction between the individual's inner structure and prestructures and the objects and people around him, by the integration of the new into the old, and the restructuration of the old into even more general and higher-level constructs (p. 120).

However, Sinclair (1970) also refers to remarks by Brown (1969) that cognitive structures are not linguistic structures and notes, "We are still far from being able to spell out in linguistic terms how this development proceeds" (p. 119). A group of experiments described by Sinclair-de-Zwart (1969) lends support to the view that there is a relation between linguistic and operational level. In addition, the difficulties encountered by the child in language were similar to those the child experienced in the development of operations, i.e., "lack of decentration and incapacity to coordinate" (p. 325). Verbal training, however, did not

bring about operational progress in subjects without conservation. Data on the relationship between language and operations were interpreted as confirming the view that "language is not the source of logic, but is on the contrary structured by logic" (Sinclair-de-Zwart, 1969, p. 325).

Language Differentiation and Field Dependence-Independence

The relationship between mode of field approach and verbal functioning was not considered in Witkin's (1962) conceptual framework. However, while studies expressly concerned with the relationship were not performed some evidence relating to "verbal skills" accumulated in the course of research. The data indicated that some verbal skills (a collective term used to describe various kinds of verbal ability) showed "little or only a limited relation to mode of field approach and other characteristics of differentiation" (p. 203). The skill designated as "verbal comprehension" in factor-analytic studies of the Wechsler Intelligence Scale for Children (Goodenough and Karp, 1961) was unrelated to mode of field approach. The factor was defined by three subtests, Vocabulary, Comprehension, and Information. The child's "verbal expressiveness" defined as the ability to give extended fluent verbal accounts, was also unrelated to mode of field approach. A measure of

verbal expressiveness was based on data obtained through clinical interviews and TAT stories. A broad dimension of behavior termed cognitive clarity was evaluated in interviews. This dimension significantly related to an analytical field approach. Cognitive clarity reflects a continuum along which the child's thoughts may range from blurred, confused and unassimilated to "discrete," "structured," and "assimilated." Finally, two studies suggest that the ability to overcome an embedding context in a verbal task may be unrelated to the ability to overcome an embedded context in a task involving configurational stimuli. Podell and Phillips (1959) administered an anagram problem in which meaningful words had to be rearranged to form new words. The test did not load a spatial decontextualization cluster, a factor similar to Witkin's mode-of-field approach cluster. Again in a study by Frick, Guilford, Christensen, and Merrifield (1959) a Camouflaged Words test, another task involving verbal embeddedness, did not appear on an adaptive flexibility factor. The adaptive-flexibility factor, however, has been shown to be related to field-dependence-independence measures (Karp, 1963). Witkin et al (1962) concluded concerning verbal ability: "It is clear that the growth of some kinds of verbal skills may follow a different path than the development of differentiation" (p. 203). Achievement on certain

types of language tests may be related to the field-dependent behavior, however. In his study of academic learning in gifted children Haggard (1957) found that high achievers in language (punctuation, capitalization, and so on) and spelling were characterized by passivity, dependence on outside sources for direction of thoughts and actions, and reliance on conformance and social techniques to gain acceptance. Haggard suggests that obedient carrying-out of rules learned by rote is essential for the language and spelling tasks. "The stimuli need not even reach a symbolic level, but rather, can remain specific learnings which are unmodified over time" (p. 399). The characteristics demonstrated by the children in this study are similar to those shown by children with a relatively global field approach. Relevant to the question of "verbal comprehension" and field dependence-independence is a study by Crandall and Sinkeldam (1964) conducted with 10-and 12-year olds. They found significant correlation among field-independence and the three WISC subtests, Vocabulary Comprehension, and Information which load the "verbal comprehension factor." Wachtel (1968) found comparable results for young adults.

Witkin (1962) has suggested the development of tasks which allow an evaluation of extent of articulation in language. "It would be our expectation that this particular aspect of linguistic functioning would be related to mode of field approach and other characteristics of developed differentation" (p. 202).

Language Differentiation and Conceptual Differentiation

Evidence on the relation between conceptual differentiation and verbal skills for adults suggests that categorizing style and particular measures of language are not associated. Gardner and Schoen (1962) found that Pearson correlations between the number of groups score on Gardner's (1953) original Object Sorting Test and the Wechsler Bellevue Similarities subtest score were non-significant. Correlations between the abstraction score (percentage Conceptual Definition score) and the Wechsler Similarities subtest score were also nonsignificant. Gardner, Jackson and Messick (1960) found that conceptual differentiation on Gardner's (1953) Object Sorting Test and preferred level of abstraction were both unrelated to performance on the Wide Range Vocabulary Test. There findings led Gardner and Schoen to suggest that the level of abstraction score "seems to indicate the nature of the conceptual links the subject attributes to the objects grouped, rather than the acquisition of words, per se" (p. 17). Sloane, Gorlow, and Jackson (1963) found that vocabulary, as measured by the Advanced Vocabulary Test, Loaded .11 on a factor interpreted as a sorting equivalence range factor. On the other hand, when Messick and Kogan (1963) administered 36 five-choice synonym items adapted from the Cooperative Vocabulary Test, the score for the

number of categories of two or more objects correlated significantly with the vocabulary measure ($r = .23$, $p < .05$). In their study of individuality at preadolescence Gardner and Moriarty (1968) found that ability to abstract, as indicated by the WISC Verbal score, correlated -.10 with the number of groups produced by children in an object sorting test. The correlation between the Similarities subtest and the number of groups score was -.02. Gardner and Moriarty (1968) indicated a partial association of verbal skills with conceptual differentiation. Low conceptual differentiation (broad categorization) loaded -.52 and WISC Verbal (high verbal score) loaded .44 on a factor described as Explorativeness. In a study conducted with grade six children Wallach and Kogan (1965) utilized a test of thematic integration in which a subject was shown a set of four words printed on a card and instructed to make up a story using all words. For boys in the study, the number-of-groups formed in a sorting test (greater conceptual differentiation) was significantly associated with ability to produce stories which were well-integrated and imaginative ($r = .28$, $p < .05$). A review of the literature indicates that the area of verbal ability and conceptual differentiation is one that is relatively unexplored. Gardner and Moriarty (1968, p. 305) suggest "the potential fruitfulness of .... a large-scale assault on the

generality of verbal ability, as well as other aspects of verbal style."

The possibility of a relationship between language and cognitive style has been questioned by some investigators.

IV. READING

Some theoretical considerations on meaning in reading are discussed in the following section. The view of reading as a cognitive function (e.g., Stauffer, 1970) places it within a cognitive development, language-based context. Reading may be regarded as a two-step process involving word recognition and comprehension (Wiener and Cromer, 1967). In the present study comprehension is used as the criterial behavior of reading. Reading comprehension may be viewed as an active process involving the reconstruction of meaning. Over the years the significance of the control of meaning has been stressed in the reading literature. McKee (1937, p. 115) has said of printed symbols that "they act merely as fuses to stimulate him (the reader) to make meaning in his mind." Betts (1946, p. 4) has viewed the reading process as the reorganization of experiences back of the symbols. Burton (1956, p. 27) has written that the development of meaning in reading is "a reciprocal process between the printed page and the mind of the reader." Smith and Dechant (1961, p. 23) have indicated that, "In reading the critical element is not what is seen in the page, but

rather what is signified by the written symbol." Monroe (1971, p. 121) has pointed out that, "underlying the interpretive skills of reading are the interpretive skills of language." Wiener and Cromer (1967) hold that comprehension can occur "only after identification and language skills have been mastered." Wiener and Cromer indicate that "meaning is available primarily through language as it occurs in the auditory form" (1967, p. 638). According to this theory individuals with limited language skills or limited experiences are considered as having difficulties in these specific areas "rather than in reading per se."

Smith and Holmes (1971) assert that the fluent reader must make use of the meaning of what he reads in order to identify words. "Text can be comprehended only if it is read for meaning in the first place" (1971, p. 413). Smith (1971) distinguishes between learning to read and fluent reading. Correspondingly, he distinguishes two processes of comprehension, mediated meaning identification and immediate meaning identification. In the former, one approaches comprehension through the identification of individual words. Immediate meaning moves directly from the visual feature discrimination to comprehension. Comprehension can be considered to occur when the visual configuration, the written phrase or sentence or passage can be allocated to one of an unknown number of alternative cognitive structures or meanings (1971, p. 186). "The cognitive

picture of man," Smith (1971, p. 81), "is of an active and selective information gathering individual." For Smith, knowledge of the world and of language are basic to success in reading.

During the past ten years reading research has been influenced by the two schools of linguistic theory representing the structural approach and the generative transformational approach. This influence is reflected in proposed models of the reading process (e.g., Brown, 1970; Ruddell, 1970; Goodman, 1968), in research reports and reviews (e.g., Levin, 1965; Ryan and Semmel, 1969), and in published texts (e.g., Levin and Williams, 1970). Current trends in the study of reading and language also indicate the growing influence of cognitive psychology. Williams, (1970, p. 273), for example, predicts greater stress in reading on meaning, language development, and critical thinking.

Theoretical questions on the nature of the writing system are currently influencing formulations of the nature of the reading process. Transformational grammarians propose that orthography corresponds closely to the underlying abstract lexical level of language. For one who knows the language "an orthography corresponding to lexical representation omits redundant phonetic information and permits the most rapid transition to the semantically significant units" (Chomsky, 1970, p. 13). The thesis that the orthography corresponds to the deeper representations of speech is

leading to further examinations of the meaning basis of the correspondence between printed and spoken messages (e.g., Ryan, 1969, p. 59).

Cognitive emphases in reading, at present, have implications both for the study of word recognition and of comprehension.

Kagan (1966) considers the following variables to be relevant in determining the quality of intellectual products: (a) the cognitive units of rules and vocabulary resources organized hierarchically, (b) habits for processing information, and (c) determinants of attentional involvement, including standards, motives and conflicts (p. 115). He states: "We must focus on this whole array, by either including measures of them all or controlling them, if we are to understand the details of conceptual development (p. 115). Reading may be regarded as an intellectual product for which these variables have relevance.

V. SUMMARY

The focus in this chapter has been upon an examination of selected theories of cognition, and a discussion of particular aspects of cognitive style, language and reading development. The summary is organized around the concept of development, and the theories considered basic to the study have been identified.

It was not the purpose of the chapter to construct an over-all

scheme but to examine specific constructs relative to language and cognitive functioning. Development is assumed to proceed from lesser differentiation to greater differentiation and hierarchic integration. The individual is viewed in the context of cognitive development as a structuring agent interacting with the environment. Knowledge develops through this interaction and evolves as a result of the interplay between the individual and his milieu. The processes of interaction have been described in the theories of Piaget, Werner, Bruner, and Lewin. Their schemas indicate a correspondence of ideas on the developmental stages in cognition.

As yet, descriptions of language differentiation are incomplete. However, several investigators (e.g. Cromer) suggest that a certain measure of cognitive growth is basic to language differentiation. Studies in concept formation indicate that patterns of language differentiation at least parallel the patterns of cognitive growth. Language, viewed as an interactive phenomenon, is described in terms of conceptual systems, e.g., Piaget's sensorimotor and concrete operations; Werner's concepts of rigidy and flexibility.

Cognitive style is defined as the individual's characteristic mode of interacting with his environment. Whether or not cognitive style, the disposition to particular modes of acting, has a bearing on specific aspects

of language and cognitive development in children is open to question. A hypothesis basic to the present study is that cognitive style bears on the nature of the stimulus input as the individual interacts with the environment, and therefore should be considered for its possible effect on both language and cognitive growth.

Recent theories of reading are focusing on meaning-processing behavior. The burden of comprehension consists in the individual's own capacity to bring meaning to the ideas represented by the printed symbols. Reading performance, as both a language product and a cognitive product, may be studied in terms of both language differentiation and cognitive style.

CHAPTER III

A REVIEW OF THE RESEARCH

The review of the literature has been divided into three sections. Part one includes a discussion of cognitive style under the following headings: (1) the nature of cognitive style, (2) field dependence-independence, (3) conceptual differentiation, (4) analytic cognitive style and (5) category width. Implicit in the study is the assumption that individual differences in language responses indicate individual differences in concept formation. Part two of the review is therefore concerned with concept formation, the nature of the concept, and the genetic development of categorization. Part three is concerned with qualitative levels and developmental trends as revealed through the verbal responses of children, and presents a review of vocabulary, word association, research.

I. COGNITIVE STYLE

Cognitive style research is concerned with stable, self-consistent individual differences in modes of cognitive organization and functioning. The theoretical foundations of cognitive styles have been established in three major programs of investigation:

(a) the work of Witkin and his co-workers (Witkin et al., 1954; Witkin et al., 1962) on field dependence-independence and psychological differentiation.

(b) the research program at the Menninger foundation by Gardner et al. (1959, 1960) on the identification of cognitive control principles.

(c) the program of investigation initiated by Kagan, Moss and Sigel (1963) on descriptive, relational and categorical styles and the construct, conceptual tempo.

Cognitive style theories have been reviewed by Christie and Lindauer (1963), Maccoby (1964), Holtzman (1965), Klein et al. (1967) among others.

Coop et al. (1970) note that the term "cognitive style" has been appearing and reappearing in the psychological literature since the turn of the century. The origins of current cognitive style and cognitive control research have been discussed by Tyler (1965) and Klein et al. (1967). Current developments, according to Ausubel (1968) reflect the following trends: (1) a return to the world of experience as a subject matter for psychology; (2) the recognition of cognition as an internal mediational process; and (3) a view of perceptual processes as belonging to an enlarged and complex cognitive domain.

The general qualities of cognitive style as described in the

literature indicate that they are principles which: (1) are relatively enduring, developmentally stabilized structures; (2) are revealed as individual consistencies in perceiving, remembering and thinking; (3) represent the individual's style of adaptation, his mode of coming to terms with the world; (4) are information processing variables that influence the amount and organization of information that become available to an individual; (5) are independent of each other so that a number of cognitive styles may be assumed to exist within a personality, (6) differ in the degree to which they are manifested in the cognitive functioning of individuals; (7) are activated by given classes of situations or intentions; (8) are relatively invariant over a given class of situations thus accounting for consistencies in behavior over time and over situations (Gardner et al., 1959; Gardner et al.,1960; Santostefano, 1964).

Cognitive Style of Field Dependence-Independence

Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) and Witkin, Dyk, Paterson, Goodenough and Karp (1962) have identified and carried out extensive investigations in the dimension of cognitive style referred to as field dependence-independence or global-articulated cognitive style. This stylistic tendency manifests itself in perception, in intellectual activities, and is associated with the nature

of the body concept, the sense of separate identity, and nature of defenses. It is described by Witkin (1965b) as follows:

> At one extreme 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. To these opposite poles of the cognitive style we may apply the labels global and articulated (p. 319).

Tests of field dependence-independence. Three tests which have been employed in the study of field dependence-independence are the Body Adjustment Test which evaluates the perception of the position of the body in space, the Rod-and-Frame Test which is concerned with the perception of the position of an item in a field, and the Embedded Figures Test which requires the subject to locate a simple figure which is embedded in a larger complex pattern. Subjects who discover the figure with considerable ease are described as field-independent. Subjects who are unable to separate a simple figure from the complex field in the time alloted are described as field dependent. The relative merits of the various tests are discussed by Witkin (1967).

A second interpretation of the field dependence-independence dimension is offered by Gardner and Long (1960a) who have used the term Field Articulation. Field Articulation concerns the selectivity of attention deployment when the subject is confronted with both relevant and

irrelevant cues. Gardner et al. (1959) have suggested that an interpretation of field dependence-independence in terms of ability to extract item from field may be too narrow and propose that field-independent subjects can achieve selective attention to either ground or field, whichever is task relevant.

In a factor analytic study of analytic attitude, Messick and Fritzky (1963) identified two major approaches to the articulation of stimulus material. One approach emphasizes articulation of discrete elements; the other emphasizes articulation of figural form. Performance on a group embedded figures test was significantly related to articulation of discrete elements in a design variations task.

Several studies (Podell and Phillips, 1959; Gardner et al.,1960; Elliott,1961; Gardner, Jackson, and Messick, 1960) have indicated a close relationship between the factor of flexibility of closure defined by Thurstone (French, 1951) and the dimension of field dependence-independence. Witkin considers results obtained with tests loading the flexibility-of-closure factor as "bearing upon the field-dependence dimension" (Witkin et al. 1962, p. 52).

Research on field dependence-independence. Witkin's early research was in the experimental psychology of perception. In the 1940's Witkin, in collaboration with others, initiated a series of laboratory studies

on the nature of the sensory and field determinants of perception. These experiments sought to determine the factors involved in the ability to maintain proper orientation toward the upright in space, the means by which subjects established the upright in the absence of a visual frame of reference, the manner in which the directions of the body itself and the field as a whole are determined, and the effect of changes in the direction of the force acting on the subject's body. During the course of these studies the three procedures, the rod-and-frame situation, the tilting-room-tilting-chair situation, and the rotating-room situation were developed into standardized tests. Further testing with the standardized measures revealed a wide range of performance, characterized at one extreme by subjects who determined the upright mainly with reference to the visual field, and at the other extreme by subjects who established the upright mainly on the basis of bodily position. Individuals were consistent in their performance on a given test, and in addition some evidence was obtained of consistency of performance across different tests. Women were found to be more dependent than men on the visual field. The series of studies established 1) that individuals differ markedly in their modes of perception as indicated by performance on orientation tests, and 2) that in perceiving position with relation to the true vertical direction individuals differ from one another in degree of dependence on the visual field or in relative ability to utilize bodily experience in overcoming the influence of the field. In

addition the evidence suggested that individuals tended in different orientation tasks to demonstrate stable characteristic ways of perceiving that were associated with more general aspects of their psychological structure (Witkin et al., 1954, p. 10). The concern with motivational factors which grew out of the early studies led to a series of explorations of the role of personal factors in perception. These investigations are reported in the book Personality Through Perception (Witkin, Lewis, Hertzman, Machover, Meissner and Wapner, 1954).

The outcomes of the investigations were interpreted by Witkin et al. (1954) as follows:

> In summary then, field-dependent persons tend to be characterized by passivity in dealing with the environment; by unfamiliarity with and fear of, their own impulses, together with poor control over them; by lack of self-esteem; and by the possession of a relatively undifferentiated body image. Independent or analytical perceptual performers, in contrast, tend to be characterized by activity and independence in relation to the environment; by closer communication with, and better control of, their own impulses; and by relatively high self-esteem and a more differentiated, mature body image (p. 469).

Zigler (1963) suggested that the relationships found between field independence and other variables may be accounted for by a common relationship between all the scores, and general intelligence. In reply, Witkin (1963) pointed out that only particular subtests of the WISC are related to the Embedded Figures Test, and it is performance on these tests which is primarily responsible for the correlations found with IQ.

Over the past years the research of Witkin and his co-workers has turned to a longitudinal study of the development of differentiation during the period from childhood to early adulthood. Witkin has indicated, "It is now our view that the characteristics which make up the contrasting constellation described may be conceived as diverse manifestations of more developed or less developed psychological differentiation" (Witkin, 1965, p. 323). In addition, Witkin (1965) has pointed out,

> It is our view that these various characteristics which we have found to cluster together, are not the end products of development in separate channels, but are diverse expressions of an underlying process of development toward greater psychological complexity (p. 323).

Style of experiencing is considered a central characteristic of psychological differentiation and the articulated-global dimension of cognitive style a "tracer element" of level of differentiation.

Witkin's second major report, Psychological Differentiation (Witkin, Dyk, Faterson, Goddenough, and Karp, 1962) presents the new theoretical formulation, the results of investigation of psychological growth conducted by the Witkin group, and relevant studies by independent researchers. Subjects for the Witkin studies were children; the main studies were conducted with three groups of ten-year-old boys. The study was concerned with three major problems: individual self-consistency as an expression of level of differentiation; the influence of life experiences and early characteristics of children on progress toward greater differentiation;

and the stability of psychological patterns of functioning during the growth years and in adulthood.

Performance on tests of field dependence-independence was used as an indicator of extent of differentiation. Procedures also included a series of problem-solving and intelligence tests, projective tests, and an interview. In general, results for the study confirmed expectations and supported the concept of psychological differentiation. In a review of studies on psychological differentiation Witkin et al. (1962) concluded:

> In summary, it may be said that the work...and other similar work, suggests a linkage between the level of a child's cognitive development and the extent of his psychological differentiation. We are now inclined to consider that an active analytical field approach is itself an indicator in the cognitive sphere of progress toward differentiation, and that a passive global approach is indicative of limited differentiation (p. 352).

Field dependence-independence and sex differences. Early investigations by Witkin (1949a, 1949b) indicate findings of sex differences in extent of field dependence in adults. Generally women tended to be more strongly influenced by the structure of the surrounding field than men.

Witkin (1950) found that fifty one male and fifty one female college students differed widely in the time taken to find the simple figures within larger complex patterns. The time score for men for twenty-four items ranged from one minute, fifty-four seconds to fifty-five minutes, eighty-four seconds, while time scores for women ranged from three minutes,

six seconds, to seventy-one minutes and zero seconds. The average time score for males was approximately sixteen minutes while that for females was approximately twenty-three minutes. The frequency of items was eighty-eight for females versus thirty-five for males.

In a summary of data on sex differences in perception at different ages, Witkin et al. (1954) pointed to a tendency at all ages for females to be more field dependent than males. However, they indicated, "It is not until the adult level that this sex difference in perception is established in a pervasive and consistently significant way by the test results" (p. 148).

Bieri, Bradburn, and Galinsky (1958) found males to be superior to females on a short form of the Embedded Figures Test ($p < .01$). Karp (1963) has indicated that sex differences in field dependence are not present in subjects over sixty. Schwartz and Karp (1967) found that males were more field independent than females for the age range seventeen to thirty-nine, but reported an absence of difference for groups of older men and women.

In a later study using the same form of the EFT as had been used by Bieri et al. (1958), Bieri (1960) found that the mean scores of thirty male and thirty female college undergraduates on the Embedded Figures Test were not significantly different.

Elkind, Koegler, and Go (1963) reported a median time score of 20.25 seconds for males on the Embedded Figures Test. For females the

median score was 52.6 seconds.

Stuart, Breslow, Brechnev, Illyus and Wolpoff (1965) found that a group of twenty-eight males did not differ significantly from a group of thirty-six females in mean time scores on a short form of the Embedded Figures Test. Evans (1967) reported no sex differences for fifty-nine undergraduates tested with eight items of the Embedded Figures Test. Vaught (1965) suggested that role identification and ego strength are basic to the sex differences in Rod-and-Frame Test performance.

Witkin, Goodenough, and Karp (1967) report significant sex differences for the Rod-and-Frame Test and the Embedded Figures Test in data for a cross-sectional study involving the age groups eight, ten, eleven, twelve, thirteen, fifteen and seventeen, college females with an average of 19.6 years, and college males with an average age of 21.2 years. Data for a longitudinal study for the period eight - thirteen years indicated significant sex differences on the Rod-and-Frame Test ($F = 4.33$; $p < .05$). Results from a longitudinal study over the period ten - seventeen years, indicated nonsignificant sex differences although the trend was in the expected direction. Witkin et al.(1967) noted an overall tendency in both the cross sectional and longitudinal data for males to be more field independent than females.

Questions about the early origins of analytical-global cognitive style led to the development of a children's version of the Embedded Figures

Test called CHEF (Goodenough and Eagle, 1963) and to a revision of CHEF designated CEFT or Children's Embedded Figures Test (Karp and Konstadt, 1963). During the refinement of CHEF (Goodenough and Eagle, 1963) data were obtained for twenty-four boys and twenty-four girls at age eight. No significant sex differences in performance on CHEF were evident at these age levels. Similar results were obtained during standardization procedures for CEFT. Subjects were 160 children equally divided among four age groups five to six, seven to eight, nine to ten, and eleven to twelve. Each age group contained an equal number of boys and girls. Sex effects on CEFT performance were not significant.

The correlation between scores for the CEFT and a twelve-item form of Witkin's Embedded Figures Test was .71 for forty subjects ages nine to ten, and .85 for forty subjects ages eleven to twelve.

Bigelow (1967) explored the relationship between performance on the Children's Embedded Figures Test (CEFT) and age, sex, and intelligence in a final random sample of 160 children aged five to ten. Four age spans were investigated, i.e., 60-74 months, 75-89 months, 90-104 months, and 105 - 119 months, with twenty boys and twenty girls at each age level. No significant differences were found between CEFT scores for all tested five to ten-year-old boys and all tested five to ten-year-old girls. Bigelow points out that differences in mean performance on the CEFT "never seemed to even commence divergence in the four age groups

studied (p. 69)." The findings further suggested that "by age ten...boys and girls still seem to use similar cognitive global-analytical modes" (p. 70).

Corah (1965) reported no difference between Children's Embedded Figures Test scores for thirty boys and thirty girls between the ages of eight and eleven years.

In their monograph on individuality at preadolescence, Gardner and Moriarity (1968) report findings for Thurstone's Concealed Figures Test, and a short form of Witkin's Embedded Figures Test for twenty-nine boys and thirty-one girls ranging in age from nine to thirteen. Differences between boys and girls were nonsignificant for both tests.

Field dependence-independence and intelligence. Positive correlations have been demonstrated between intellectual ability and performance on the Embedded Figures Test (Jackson, Messick and Myers, 1961). Relationships, however, tend to be complex (Frederick, 1967).

Jackson (1957) compared the performance of forty-three undergraduate students on Witkin's Embedded Figures Test and the American Council of Education Intelligence Test. He obtained a correlation of $-.53$ ($p < .001$) indicating that field dependent students tend to have lower scores on the intelligence test.

Bieri, Bradburn, and Galinsky (1958) reported non-significant correlations between time scores on the Embedded Figures Test and the verbal subtest of the Scholastic Aptitude Test (SAT) for a sample of college students (-.06 for men and -.21 for women). Significant correlations between the Embedded Figures Test and SAT mathematics subtest were reported for both males (-.50; $p < .01$) and females (-40, $p < .01$).

Gardner, Jackson and Messick (1960) explored the relationship between field articulation and the abilities of verbal knowledge, general reasoning, and ideational fluency. Subjects were sixty-three females, college students, ranging in age from seventeen to twenty-two. Results indicated a significant correlation between the Embedded Figures Test score and the Wide Range Vocabulary score. Correlations between field-articulation scores and scores for general measures of reasoning and ideational fluency were nonsignificant. The authors pointed out:

> These results help to delimit the major area of relevance of the field articulation control principle. It seems obvious that it is not a "g" factor relevant to all varieties of cognitive behavior. At least in the present sample it involves cognitive processes, largely different from those represented by the abilities called general reasoning and ideational fluency" (p. 66).

Gardner and Long (1960a) have suggested that the cognitive control of Field Articulation may affect learning and recall in situations in which the subject must attend to stimulus materials containing distracting elements, and in situations in which the subject must attend to relevant

versus compelling irrelevant memory elements. They have also reported a relationship between performance on Witkin's Embedded Figures Test and performance in learning and recall situations (Gardner and Long, 1960b).

Elliott (1961) found that the time score for nine items from Witkin's Embedded Figures Test correlated significantly with Quantitative ability and Linguistic ability scores for 128 male undergraduates. Correlations were -.29 ($p < .01$) and -.21 ($p < .05$) respectively.

White (1954) reported a correlation of .59 between performance on the California Test of Mental Maturity and scores on the Concealed Figures Test for fifteen-year-old subjects.

Witkin (1962) cites a preliminary study by Woerner and Levine (1950) in which a group of twelve-year-olds consisting of thirteen boys and thirteen girls were administered the Wechsler Intelligence Scale for Children and several perceptual tests including the Embedded Figures Test. The product-moment correlations between the WISC Verbal scale and the Embedded Figures Test were .54 for boys and .57 for girls ($p < .05$). Correlations between the WISC performance scale and the Embedded Figures Test were .88 for boys and .73 for girls ($p. < .01$). Overall findings for the study suggested a relationship between Performance in the WISC and performance on the perceptual tests used by the Witkin group. In addition correlations with the perceptual tasks were higher for the performance

portion of the WISC than for the verbal portion.

Goodenough and Karp (1961) explored the nature of the relationship between intelligence and field dependence in a factor analytic study of intercorrelations among the Wechsler Intelligence Scale for Children and three measures of field dependence: the Embedded Figures Test, the Rod-and-Frame Test, and the Tilting-Room-Tilting Chair Test. The writers hypothesized that significant relationships between field dependence measures and IQ scores on the Wechsler Intelligence Scale for Children (WISC) demonstrated in the unpublished study by Woerner and Levine (1950), were the function of a capacity to overcome embedding contents. Subjects were twenty-five boys and twenty-five girls, ages 11.5 to 12.5. The first three factors which were extracted in the study corresponded to the three major factors which have been identified in factor analyses of Wechsler Scales. Factor I on which WISC subtests Vocabulary, Information, Similarities, Arithmetic, and Comprehension had loadings, was identified as the verbal comprehension factor observed in studies of the Wechsler tests. The Embedded Figures Test loaded -.07 on this factor. Factor II, the attention-concentration factor isolated in earlier studies was loaded by Digit Span, Arithmetic and Coding subtests of the WISC. The loading of the Embedded Figures Test on this factor was .10. The three tests of field dependence-independence, i.e., the Embedded Figure Test, the Rod-and-Frame Test and the Tilting-Room-

Tilting-Chair Test had their highest loadings on Factor III. Also highly loaded in this factor were the three WISC subtests, Block Design, Object Assembly, and Picture Completion, subtests which define a closure factor. It was suggested that a common requirement for these tests may be the capacity to overcome embeddedness. Goodenough and Karp concluded:

> These results tend to support the Witkin hypothesis that relationships obtained in many studies between tests of field dependence and standard tests of intelligence stem, at least in part, from common requirements shared by measures of field dependence and of certain kinds of intellectual abilities (p. 245).

Crandall and Sinkeldam (1964) reported a significant relationship between Stanford-Binet IQ and scores for the ten easiest figures on Witkin's Embedded Figures Test for six to twelve-year-old children (-.40 for girls, $p < .05$; -.49 for boys, $p < .01$; -.45 for total sample, $p < .01$). Relations between the children's performance on the Wechsler Intelligence Scale for children and performance on the Embedded Figures Test were also determined for the same sample. Crandall and Sinkeldam report that "especially for the older children, perceptual field dependence is as often associated with WISC verbal subtest scores as with WISC performance subtest scores" (p. 18). The tendency to be field dependent on the Embedded Figures Test correlated -.40 ($p < .05$) with the WISC Information subtest score; -.47 ($p < .05$) with the WISC Comprehension subtest

score; and -.49 ($p < .05$) with the WISC Vocabulary subtest score.

Corah (1965) assessed verbal intelligence in sixty children ranging in age from eight to eleven years with the Full-Range Picture Vocabulary Test. Correlations between IQ and performance on the Children's Embedded Figures Test were positive but not significant.

Bigelow (1967) employed the Peabody Picture Vocabulary Test (PPVT) as a measure of verbal intelligence in his study of cognitive style in children age five to ten years. Results indicated no significant difference between Children's Embedded Figures Test (CEFT) performance of high and low IQ groups. The correlation coefficients between CEFT scores and PPVT raw scores and PPVT IQ scores were .596 and .226 respectively, both significant at .01 level. Correlation coefficients between CEFT scores and PPVT raw scores, and between CEFT scores and PPVT IQ scores for four age groups (sixty to seventy-four months, seventy-five to eighty-nine months, ninety to one hundred four months) were significant for the highest age group only. Thus in three out of four age groups CEFT performance was independent of IQ performance. A comparison of CEFT and PPVT raw score means by age group indicated similar patterns of increase in scores of both tests suggesting that field dependence independence and verbal intelligence if separate, "at least proceed along similar developmental paths between ages five and ten" (p. 68).

Gardner and Moriarty (1968) reported a relationship between the tendency to articulate fields and WISC Verbal factor scores. Variables drawn from six major blocks of data, including cognitive control principle factor scores and WISC factor scores were included in a final factor analysis of data for a total sample of sixty children. Field Articulation loaded .47 (great articulation) and the WISC Verbal factor loaded .34 (high verbal score) on Factor I, a factor defined as Field Articulation. The authors noted:

> The loading on the WISC Verbal factor was ... unanticipated and could be a sampling artifact. Other studies of adults and children (e.g., Gardner et al. 1959; Goodenough and Karp, 1961) have clearly shown that field-articulation is associated with performance in such tests as Block Designs and Object Assembly, Spatial Relations and Orientation tests involving the articulation of relevant versus irrelevant stimuli, and so forth and is not associated with verbal ability as measured in a variety of ways" (p. 212).

Witkin (1962) has described the relationship between intelligence and field dependence as follows:

> The thought may have occurred to you that all I have been talking about is a difference in intelligence among children. There is in fact a slight correlation between total IQ scores and scores for our tests of perceptual field dependence. But it is now pretty clear that this relationship is carried by particular subtests of intelligence tests, those which require the same kind of analytical ability as the perceptual tests themselves ... if you break up standard intelligence tests into their three main components, what you find is that children who are

> more field independent are superior to field-dependent children only on the analytical cluster of subtests, which require the same kind of analytical ability as the tests of field dependence. They are not identifiably different in their performance on the verbal subtests or the attention-concentration subtests. We may say then that some subtests of standard intelligence tests pick up the same dimension of cognitive functioning as the perceptual tests, and it is this which is responsible for the observed relation between scores for the perceptual tests and total IQ. Certainly we cannot say that field-independent children are superior in general intelligence (p. 33).

Field dependence-independence and conceptual behavior.

Several studies have indicated that an analytical approach has implications for conceptual behavior.

Baggaley (1955) conducted a correlational study to determine the cognitive variables operative in concept formation. Nine variables were chosen on the basis of Thurston's factors.

Correlations were obtained between scores for each variable and performance on a card sorting test. Of the five variables Speed of Closure correlated most highly with the sorting score. Strength of Closure was also one of two variables which correlated significantly with "variability score," an indirect measure of analytical ability on the card sorting task. Baggeley (p. 304) suggested "concentration on one aspect of a complex stimulus situation" as common requirement in the closure and concept formation tasks. As a result of his findings Baggaley concluded that subjects

high on Strength of Closure adopted an analytical method in card sorting performance. The measure of Strength of Closure was the Thurstone's Concealed Figures Test, a test which has been found to load on the same factor as Witkin's Embedded Figures Test (Gardner et al. 1960).

The relationship between concept identification and cognitive style was explored in a study by Davis (1967). A group Hidden Figures Test was administered to 310 twelfth-grade boys. The thirty high scorers on the Hidden Figures Test made fewer errors on the concept identification test than subjects with medium scores. Medium scorers, in turn, made fewer errors than low scorers.

Barash (1955) tested thirty-six female subjects ranging in age from eighteen to thirty-nine years with Witkin's Rod-and-Frame test and an adaptation of the Vygotsky Concept Formation Task. The purpose of the study was to determine whether there was consistency of performance in the two tasks. It was suggested that the grouping of the blocks on the basis of immediately given, single attributes is a manifestation of field dependence, whereas grouping based on an active combination of attributes represents a degree of field independence. The Product moment correlation between the scores on the rod-and-frame test and the Vygotsky test was .37, indicating consistency in the mode of approach to the two tasks.

Elkind, Koegler and Go (1963) noted that an analytic approach to perception may not be beneficial on tests which require verbal concept formation such as the Similarities subtest of the Wechsler Intelligence Scale for Children. They hypothesized that an analytic approach would be an asset on tests that require perceptual concept formation. They tested fifty-six subjects with the short form of the Embedded Figures test, and the Abstraction test (SHA0 of the Shipley Hartford Scale, and the Vocabulary Test (SHV) of the Shipley Hartford Scale. The abstraction test (SHP) of the Shipley Hartford Scale was considered to measure perceptual concept formation because it is required the subject to abstract novel relations from arrangements of letters and numerals and because verbal meanings were generally not involved. Males and females were divided into field dependent and field independent groups. Field independent subjects scored significantly higher than field dependent subjects on the SHA. Differences were not significant for the SHV. The hypothesis that an analytic approach "is an asset on tests that require the abstraction of elements and relations from things as opposed to words" (p. 385) was confirmed.

Frederick (1967) cites Ladd's analysis of concept learning. Ladd (1967) has indicated that a skill required in concept learning is the ability to adopt different interpretations of data. Lacking this ability the subject will make errors because of his slow adaptation to the concept

learning task. Frederick (1967) notes:

> A global approach may not affect conceptual ability per se, but it may be indicative of a weak, passive, and an inappropriate approach to concepts. An approach that must be overcome before learning can occur at the level of analysis that concepts require" (p. 25).

The relationship between conceptual ability and field articulation in children has been studied by Frederick (1967). Subjects were 256 boys and girls in grades six, eight and ten. The tests given were the Hidden Figures Test, the Tagatz Information Processing Test, and two concept learning problems.

An analysis of variance indicated that subjects high in the Hidden Figures Test (more analytical subjects) had significantly higher scores on the information processing and concept learning tests than subjects low on the Hidden Figures Test (less analytical subjects). It was concluded from the overall results that analytical subjects are significantly superior to global subjects in information processing and concept learning abilities. Several patterns of performance were identified. For example, young analytical subjects were more sensitive to the amounts of relevant information than the global subjects. However as analytical subjects matured their awareness decreased. It was suggested that "with age the S's develop powers of analysis that are independent of the information load" (p. 89). In information processing global subjects in the sample tended

to make more inclusion, exclusion and indecision errors than analytical subjects. Global subjects also showed more overall inclusion errors in concept learning than the analytic subjects.

Dickstein (1968) examined the relationship between specific features of concept attainment performance and field independence. Ninety-six female subjects were given Thurstone's Concealed Figures Test (CFT). Twenty-three subjects were then selected from the highest quartile and twenty-three subjects from the lowest quartile on the CFT. These subjects were administered the short form of the Embedded Figures Test and a concept attainment task. Intelligence tests scores from the Otis Self Administering Test of Mental Ability were included in the analysis of the data. Each protocol on the concept attainment task was scored for four measures: the number of choices to solution, the number of incorrect verbalizations of the concept, the number of informationally redundant choices, and the number of unvaried attributes (attributes untested for relevance to the concept). High and low field-independent groups differed significantly on the four measures of performance, i.e., high field-independent subjects gave a smaller number of choices to solution, made fewer redundant choices, relied less on incorrect verbilization and left fewer attributes unvaried. Otis intelligence test scores were unrelated to concept attainment scores. It was concluded that

"field-independence" is relevant to concept attainment when the task involves an array of complex perceptual stimuli (p. 641).

Elitcher (1966) hypothesized a relationship between analytic and global cognitive style and the quality of children's concepts of physical causality when bias due to level of general intelligence was eliminated. Subjects were 136 fourth-grade children ranging in age from eight years, nine months and ten years. Two sets of questions on a variety of physical phenomena, one phrased in a "Why" form, and the other phrased in a "How" form, the children's Embedded Figures Test, and the Wechsler Intelligence Scale for Children were administered. Cognitive Style groupings were established. Responses were rated according to increasing levels of maturity as non-naturalistic, phenomenistic, and naturalistic. It was expected that questions worded in the "Why" form would yield more immature responses than questions worded in the "How" form. It was also anticipated that children with a global cognitive style who were questioned in the "Why" form would give more immature responses than a Global group questioned in the "How" form, an analytic group questioned in the "Why" form, and an analytic group questioned in the "How" form. The expectation with respect to the effect of wording on the type of response was confirmed. It was also found that Global children did not differ from Analytic children in terms of the three classes of responses, non-naturalistic, phenomenistic, and naturalistic. It was

concluded that a relationship exists between Witkin's concept of cognitive style and Piaget's concept of children's causal thinking and that the relationship is demonstrated when children who differ in cognitive styles respond to questions on physical causality phrased in the "Why" and "How" form.

Stability of field dependence-independence. Performance on tests of field dependence-independence was followed longitudinally by Witkin, Goodenough, and Karp (1967) with two groups, one for the age period eight to thirteen years, and the other for the period ten to twenty-four years.

Developmental curves for both longitudinal and cross-sectional data indicated clear trends toward increasing field independence up to age seventeen. The rate of change tended to slow down with increasing age. A leveling off of the trend toward increasing field independence from age seventeen to twenty-four was indicated in the longitudinal data and suggested that the development process may be completed by age seventeen. In the cross-sectional data males were significantly more field-independent than females on the Rod-and-Frame Test and the Embedded Figures Test. In the longitudinal study, males in the eight to thirteen year group showed significantly greater field-independence than females on the Rod-and-Frame Test. Differences for the ten to twenty-four year group

on the Rod-and-Frame Test, while not reaching significance, also indicated greater field independence for males. Test performance of the longitudinal groups showed high relative stability over the period tested. Test-retest correlations on the Rod-and-Frame Test for males and females in the ten to twenty-four year group ranged from .62 to .92, and all were significant at better than the .01 level. Test-retest correlations for the eight to thirteen year period were .76 for males ($p < .01$), and .48 for females ($p < .05$). These findings suggested that "despite a marked general increase in differentiation in perceptual functioning with age, each individual tends to maintain his relative position among his peers in the distribution of measures of differentiation from age to age" (p. 297). Data for the cross-sectional groups indicated self-consistence in performance across the tests of field dependence at all ages examined. Forty-two of 44 correlations were significant.

Two studies were reviewed (Schwartz and Karp, 1967; Comali, 1965) which suggest that a return toward field dependence does in fact occur, probably at some point in the late thirties.

Findings by Goodenough and Eagle (1963) and Karp and Konstadt (1963) have suggested a decrease in field dependence over ages five to eight. Witkin et al. (1967) cite an unpublished study by Eagle and Goodenough which found similar trends for the five to eight period with children's modifications of the Rod-and-Frame Test and the Body Adjustment

Test. From the overall findings the tentative conclusion was drawn that a progressive trend toward reduced field dependence occurs in the period from five to seventeen years.

Crandall and Sinkeldam (1964) administered the ten easiest figures from Witkin's Embedded Figures Test to fifty children ranging in age from six to twelve years. The reported highly significant correlations between field dependence and chronological age (-.74 for the total sample, -.83 for girls, and -.69 for boys).

In a study of field dependence-independence patterns in sixty families, Corah (1965) administered the Children's Embedded Figures Test to thirty boys and thirty girls between eight and eleven years of age. He found that correlations between CEFT scores and age were positive but not significant (.20 for boys, .27 for girls).

Bigelow (1967) in his study with five to ten-year-old children found a general trend toward increasing field- independence with increasing age. Difference in performance was noted within each of four age groups studied, however, such that as early as five to six "some children have achieved a degree of field- independence which other children will never reach" (p. 66).

Gardner and Moriarty (1968) reported that the capacity to isolate Embedded Figures increased over the age range nine to thirteen years.

Origins of field dependence-independence. One aspect of the research of the Witkin group has been the study of the source of differences in level of differentiation. In his studies of the possible role of constitutional experimental factors Witkin has adopted an interaction approach.

Witkin et al. (1962) report a communication from Vandenberg which described the performance of identical and fraternal twins on the Rod-and-Frame Test. Identical twins were found to be more similar in perceptual style than fraternal twins.

Stuart, Breslow, Brechner, Ilyus, and Wolpoff (1965) tested fourteen pairs of identical twins, ten pairs of fraternal twins, and a randomly paired unrelated group of thirty-two sets with a short form of the Embedded Figures Test. An examination of pairs of scores showed little variance between performance of identical twins, increasing variation for fraternal twins, and no apparent consistency between partners in the control group: Significant differences were found between the mean score of the identical twins and the fraternal twins, and between the mean scores of the identical twins and the non-filial group. Results were interpreted as supporting the hypothesis that "there are significant genetic influences upon the mode of perception as measured by the Witkin Embedded Figures Test. Short Form (p. 420).

In their study of environmental influences on the development of differentiation, Witkin et al. (1962) began with the child's experiences in the family and in particular with his relation to his mother. Data are presented for a group of boys and their mothers. Witkin et al. (1962) reported a broad hypothesis for their studies which stated that children whose differentiation is limited have had relations with their mothers of such a nature as to interfere with the opportunity for psychological differentiation, (p. 273) and that "highly differentiated children have had relations with their mothers of a nature that permitted or even fostered progress toward differentiation" (p. 273). Mother-child interactions were explored through a series of home interviews.

Corah (1965) studied patterns of relationship on measures of differentiation in sixty families. The sample included thirty boys and thirty girls ranging in age from eight to eleven and both fathers and mothers of the children. The children were tested with the Children's Embedded Figures Test (CEFT) while the parents were given the first twelve figures of Witkin's Embedded Figures Test. A Figure Drawing (FD) test which yielded a sophistication of body concept score was administered to all subjects as a second measure of differentiation. CEFT and FD scores for boys were significantly related to mothers' EFT scores. Boys' EEFT scores correlated .38 ($p < .05$) with fathers' FD scores but other relationships

between boys' scores and fathers' scores did not approach significance. Correlations between girls' and mothers' measures of differentiation were non-significant. Girls' FD score correlated .38 with fathers' EFT, ($p < .05$). The correlation between girls' CEFT and fathers' EFT was .28. An index score based on the Embedded Figures and figure-drawing scores was dtermined for each subject. Boys' index scores correlated significantly with those of their mothers (.39, $p < .05$) while the correlation with the fathers' scores was .25. Girls' index scores correlated significantly with those of their fathers (.41, $p < .05$) while the correlation with the mothers' scores was .00. The results were interpreted as indicating that level of differentiation in boys is related to that of their mothers' while level of differentiation in girls is related to that of their fathers. The outcome for boys and their mothers on the measure of differentiation were considered to be compatible with the earlier results of Witkin et al. (1962). Corah concluded:

> If the level of parental differentiation may be considered an important determiner for the development of differentiation in the child, the results of this suggest that this development is in some way contingent upon the opposite-sexed parent" (p. 307).

The investigation of the relationship between family experiences and the development of differentiation in children has also been reported by Dyk and Witkin (1965). They have presented a detailed analysis of

the findings in terms of particular problems of development and have indicated the direction for further research.

Barclay and Cusumano (1967) found that male adolescents with fathers absent were more field dependent than those with fathers present.

Some implications for education. Witkin (1954) reported an attempt to effect changes in perceptual style through training. While changes were observed in performance, these appeared to involve greater endeavor to "figure things out" rather than changes in initially preferred ways of perceiving. Witkin (1965a) further reports that various other efforts to change cognitive style through experimental intervention have been unsuccessful. Elliott and McMichael (1963) found test-retest correlations of .99 between Rod-and-Frame Test measures obtained before and after training. They concluded that training does not appear to effect change in the perception mode.

Baird and Bee (1969) have reported a training study in which analytic and nonanalytic subjects received training which was opposite to their preferred styles. Changes were noted for both groups during training but a post test indicated that shifts were greater for subjects trained in analytic responding. The study indicated that training is more successful when it follows the path of development, and that the impetus of growth affects response to reward in experimental intervention.

Witkin (1965b) has considered the relevance of global articulated cognitive style to pathological functioning and forms of therapy and has also suggested a cognitive style approach in the study of mental retardation.

The implications of cognitive style for evaluation, placement and teaching methods have been examined by Witkin (1962). Concerning evaluation, Witkin suggests:

> It seems quite evident that children may be effectively characterized in terms of cognitive style; and such characterizations are particularly appropriate to the kind of sizing up of children needed in the educational situation" (p. 45).

The cognitive style approach is also suggested as a supplement to intelligence tests. Witkin also considers a "cognitive map" of the individual child which will reflect the patterning of his cognitive characteristics:

> The cognitive maps that we will in time be able to establish for individual children offer promise of providing a rich, sensitive, complex and comprehensive way of characterizing children both in their cognitive functioning and their functioning as persons .... the cognitive map concept focuses on the ways in which children are unique and the multiplicity of ways in which they may be different (p. 49).

With regard to placement, Witkin suggests that cognitive style has implications for decisions about grouping, e.g., whether children should be grouped on the basis of similarities or on the basis of differences

in cognitive patterns, whether differences in cognitive patterns between boys and girls should be considered in grouping. Also relevant to the question of placement are the cognitive styles of teachers. Witkin asks: "Might not the congruence or lack of congruence between cognitive patterns of teacher and student be important for how teaching and learning proceed?" (p. 50). The implications of cognitive style for teaching methods relate to the identification of individual differences in the cognitive patterns of children, to the ways in which children with different cognitive styles relate to their peers and teachers and to sex differences in learning. Also relevant to the question of methods is the problem of the development of differentiation in the child. Witkin suggests: "....we might imagine that emphasis in teaching on both specificity and structuring (that is, principles) would be most conducive to the development of articulation" (p. 52).

Frederick (1967) has discussed the implications of field articulation for education in terms of educational set and problem solving.

Witkin (1962) has considered the implications of sex differences in cognitive style for set-breaking capacity (e.g., Guetzkow, 1951), and in solving problems which require restructuring (e.g. Sweeney, 1953).

In a review of cognitive style, Wiggins (1968) suggests that the active analytic approach of field-independent subjects provides an advantage in perceptual and cognitive tasks. On the other hand, field-dependent subjects are more sensitive to social stimuli.

The investigation of the relationship between family experiences and the development of differentiation in children has also been reported by Dyk and Witkin (1965). They have presented a detailed analysis of the findings in terms of particular problems of development and have indicated the direction for further research.

Cognitive Style of Conceptual Differentiation

Conceptual differentiation has been investigated within the framework of psychoanalytic ego psychology and has been defined as an individual tendency in cognitive functioning or cognitive control. Cognitive control principles have been described by Gardner et al. (1960) as general principles of ego organization which modulate the expression of drives in particular classes of adaptive situations (p. 4). The concept of cognitive controls has developed from theory formulated by Klein and his co-workers. Klein and Schlesinger (1949) have described a perceptual model of the person as perceiver. The person is described as a self-regulative system:

> We assume, then, that a person is always in a state of motivation, that is, never without purpose. But, while much of his behavior is concerned with achieving objects or states which are desirable or satisfying, underlying this there is a larger motive of maintaining equilibrium inner strivings and the demands of reality (p. 36).

Out of this the individual develops "adaptive properties" - "qualities of the perceptual apparatus through which it selects and organizes

stimuli," the means for "fending off, choosing, and admitting stimulation from the welter of the outside world which, with free entrance, would traumatize and overwhelm us." Klein and Schlesinger referred to patterns of response modes as "syndromes." The syndrome was described as conveying a single perceptual attitude. Klein (1951) described perceptual attitudes as follows:

> ....The organism continually wrestles with and seeks equilibrium between two sources of tension, its inner strivings and dimensions of reality. In this task the ego puts perception to rise, as it does other systems. Perception lends itself by virtue of its "adaptive properties." But these properties common to all perceivers are employed idiosyncratically; the personal styles in using them for reality appraisal and have called perceptual attitudes (p. 335).

As conceptions were broadened, the term cognitive control, which reflects the delay function of the principles, was adopted. Reviews of the cognitive control, conceptual differentiation, (or as originally characterized, equivalance range) are included in Maccoby (1964), Holtzman (1965), Klein, Barr and Wolitzky (1967), Gardner and Moriarity (1968) and Kagan and Kogan (1970).

In early studies of conceptual differentiation, the term "equivalance range" was used as the name for the construct under investigation. The concept of equivalent and non-equivalent stimuli was developed by Kluver (1937). It holds that the same response may be elicited by widely different stimuli. Stimuli which call forth the same reaction are said to

be equivalent. In certain instances responses are elicited by a large number of different objects while in other instances the number of objects is small. These differences are defined as differences in the range of equivalence. Kluver noted that equivalence range is "linked up" with a constant factor on the stimulus side but that the "common factor" or the "identity" or "similarity" underlying particular forms of equivalence is undetermined. The problem of equivalence, he indicated, is closely related to that of similarity.

Wallach (1958) has examined the question of similarity. Wallach distinguished between potential similarity and psychological similarity. Potential similarity "may well be most usefully measured in terms of the number of common environmental features that two events are found to display." However, the attributes necessary for a judgment of similarity may be present and yet a common response not be made or a common response may be made even though an attributive basis for a judgment of similarity is lacking. Wallach holds, "If ... one conceives of the organism as selecting some attributes by which to compare items and ignoring other attributes, then it becomes reasonable to suggest a difference between potential and psychological similarity" (p. 104). Wallach suggested four ways in which psychological similarity may be defined: in terms of common properties in the environment; in terms of common responses to stimulus

objects; in terms of primary stimulus gradients; and in terms of assignment to a common category. The implications of these four definitions for "equivalence range" are discussed by Sloane (1959).

The concept of conceptual differentiation has been developed through a series of studies largely under direction of Gardner. Gardner (1953) proposed that individual differences in equivalence range represented aspects of the individual's style of adapting to the world. He explored relations between the number of groups subjects form in the categorization of objects and performance in a variety of other tasks. Categorizing behavior was measured with an object sorting test consisting of seventy-three objects. The score for the object-sorting test was the number of groups made by the subject. The results supported the hypothesis that individuals are consistent in equivalence range preference over a variety of tasks. Studies by Dickman (1954) and Marrs (1955) contributed to the delineation of the area of generality of equivalence range.

Holtzman and Gardner and Sloane (1959) identified a factor defined as "equivalence range" through factor analysis. Tests with high loadings on the equivalence range factor were object sorting, size constancy, number of free associations to the word "house," number of free associations to the word "dry" and a size estimation task. Sloane

(1959) explored the range of different behavior to which the construct equivalence range could be applied in an investigation which focused on definition and measurement of the construct. Sloane pointed out,

> If equivalence range is a rather general concept on trait it is important as it will affect most kinds of behavior. The person who refers input to relatively narrow categories and responds accordingly must perceive the world quite differently from the person with a very wide equivalence range. If all behavior starts with the categorization of input, the width of the categories used cannot help but have many implications" (p. 4).

Equivalance range has been studied in relation to other cognitive styles. One of the earlier investigations was conducted by Gardner, Holzman, Klein, Linton and Spence (1959). The purpose of the study was to test the adequacy of previous formulations concerning five controls and to develop more precise descriptions and operational definitions of the dimensions. The controls investigated were leveling, sharpening, focusing or scanning, constricted-flexible control, equivalence range, tolerance for unrealistic experiences and field dependence-independence. Sixty subjects, thirty men and thirty women, participated in the study.

Each of the six control principles was evident in the behavior of either the men or the women in the sample. Subjects with low factor scores (narrow equivalence range) divided the objects in the Object Sorting Test into many small groups, were able to maintain the distinction between retinal and actual size in a size constancy test, and gave free associations

that were close to the meaning of the stimulus word. Subjects with high factor scores (broad equivalence range), sorted objects into large groups, were unable to make required matches on a size constancy test, and gave free associations that were distant in meaning from the stimulus word. Factor scores were judged as reflecting the degree to which subjects judged stimuli to be similar. The findings suggested that broad range subjects acted on "a richer array of connotations of objects" than did subjects with a narrow equivalence range. The high loading of the number of groups score for the Object Sorting Test and the fact that it was represented only on the Equivalence Range factor indicated its usefulness as an index of the equivalence range principle. The writers concluded, "perhaps the most salient finding of the present study is that these control principles are independent of each other." This fact in turn indicated that individuals could have widely different patterns of control.

The stability of cognitive controls was investigated by Gardner and Long (1960b). They retested a group of thirty-eight female subjects from a larger group of eighty who had been tested three years previously. The Pearson correlation between test and retest for the Object Sorting Test was .75 ($p < .001$). Data for all control measures were interpreted as offering support for the assumption that cognitive controls are relatively enduring features of cognitive organization (p. 486).

Gardner, Jackson and Messick (1960) explored relations between four dimensions of cognitive control and eight intellectual abilities. The cognitive controls were equivalence range, leveling, sharpening, field articulation and constricted-flexible control. The intellectual abilities sampled were flexibility of closure, spatial relations and orientation, verbal knowledge, general reasoning, ideational fluency, associative memory, and inductive and deductive reasoning. Subjects were sixty-three female college students whose ages ranged from seventeen to twenty-two. Relationships were predicted between equivalence range scores (primarily as represented by the Object Sorting Test) and induction and deduction scores. However, correlational results indicated that equivalence range was not associated with performance in induction and deduction tests. A prediction that equivalence range scores would be associated with a score of ideational fluency was confirmed for the Object Sorting Test score and the percentage round score for the Thing Categories Test. ($n = .25$, $p < .05$, one-tailed test). An analysis of the relations between the abstraction scores on the Object Sorting Test and all the control principle and ability measures included in the study yielded forty-four correlations, only one of which reached significance. The latter correlation was judged to be a chance result. A factor analysis of intercorrelations among cognitive control and ability scores yielded six factors. Factor V received its highest

loading from the number-of-groups score on the Object Sorting Test. In general, equivalence range was unrelated to the intellectual abilities investigated in the study.

Gardner and Schoen (1962) adopted the term "conceptual differentiation" or "spontaneous conceptual differentiation" to describe the cognitive control dimension formerly called, equivalence range. Free sorting behavior was described as requiring primarily "the spontaneous differentiation of heterogeneous items into a complex of more or less related groups" (p. 3). The authors indicated that equivalence range, which they viewed in terms of conceptual realm, did not sufficiently explain the free sorting behavior. Gardner and Schoen (1962) report a series of studies of the relationship between conceptual differentiation and other aspects of concept formation. They regard spontaneous conceptual differentiation, preferred level of abstraction, and capacity for abstraction as distinguishable levels of concept formation.

The procedures established by Gardner for the Object Sorting Test requires the subject to group objects in the way that seems most logical, most natural, and most comfortable. Objects which do not seem to belong with any of the others are placed by themselves. The total number-of-groups score is composed of the number of groupings of two or more objects plus the number of single objects. Messick and Kogan

(1963) maintain that the number-of-groups score is composed of two relatively independent components, i.e., the number of categories containing two or more objects and the number of miscellaneous objects left ungrouped.

More recently, Gardner, Lohrenz, and Schoen (1968) have studied individual differences in perception of persons and objects through performance on measures of four controls considered relevant to the differentiation of experience. They have concluded:

> It seems clear that the observed consistencies in free categorizing are not primarily attributable to the differentiation with which objects and persons per se are experienced: S who categorized stimuli into many small groups does not appear to do so because of generalized disposition to perceive stimuli as relatively different or to react in terms of contrasting stimulus attributes (p. 329).

Klein et al. (1967) suggest a semantic and conceptual overlap between the terms "psychological differentiation" (Witkin et al. 1962), "conceptual differentiation" (Gardner and Schoen, 1962), "cognitive complexity" (Bieri, 1961), and "conceptual systems" (Harvey, Hunt and Schroder, 1961) inasmuch as all are concerned in some way with "the degree to which experience and judgment are articulated."

Conceptual differentiation and children. Prior to 1968 little research on the development of cognitive structures in children was reported.

One study with children (Mercado, Guerrero, and Gardner, 1963) was an exploration of cross-cultural differences in conceptual differentiation and preferred level of abstraction. The sample included twenty-nine third- and fourth grade children of middle-class status from Guadalajara, Mexico, whose ages ranged from nine years to eleven years, nine months and twenty-five children from Tapeka, Kansas, of the same ages and comparable socio-economic status. An object sorting test was administered to all children and mean values obtained for grouping and level of abstraction scores. The basic "number of groups" score was the number of groups of two or more objects, plus objects left by themselves. Additional grouping scores were also obtained, one of which was the number of groups excluding single objects. The abstraction score was based on definitions of groups containing two or more objects. A comparison of results indicated that the American children formed a greater total number of groups of objects. However, the score for American children was largely determined by their leaving many more objects as "singles," whereas Mexican children put each object with at least one other object. The authors suggest that differences could be interpreted, not as differences in conceptual differentiation but as a reflection of greater compliance to instructions on the part of the Mexican children. When single objects were not considered in scoring the number of groups, Mexican children were found to form more groups than American children.

In a discussion on the development of cognitive structures Gardner (1964) reviewed the preliminary results of ongoing research involving a group of sixty children ranging in age from nine to thirteen years. Assessment was based on information concerning various aspects of cognitive control, intellectual performance, defense mechanisms, interpretation of ink blots and behavioral ratings. Preliminary findings indicated that cognitive behavior in children, as with adults, involves a variety of cognitive structures. Findings also suggested that some cognitive functions may move not toward differentiation but toward synthesis.

An extensive analysis of conceptual differentiation in children was carried out at the Menninger Foundation as part of a study of personality organization at preadolescence. The study is presented in a monograph by Gardner and Moriarity (1968). The theoretical basis of the study is described as "grounded in an orientation to individuality that stems from psychoanalytic theory on the one hand and academic psychology on the other" (p. v). Subjects for the study were sixty children (twenty-nine boys, thirty-one girls) aged nine to thirteen from communites in the Midwestern United States. The average IQ for the sample, based on the Wechsler Intelligence Scale for Children, was in the bright normal category, with a range of scores from average to superior. Six aspects of individual consistencies in preadolescent development were assessed: cognitive controls,

intellectual abilities, performance on the Holtzman Inkblot Test; defense mechanisms; performance in a clinical testing situation and response in a laboratory testing situation; and general characteristics of ego organization. Conceptual differentiation was investigated through three procedures: Gardner's original Object Sorting Test, a Photo Sorting Test, and the Thematic Apperception Test. The Photo Sorting Test required free categorization of thirty-six pictures of persons. A preferred level of abstraction score was derived from the Object Sorting Test. An analysis of results for the Object Sorting Test indicated that boys and girls did not differ significantly in grouping, abstraction, or time scores for the test. Results were similar for the total-number-of groups score, the criterion measure of conceptual differentiation, and for the components of this score, number of single objects. The findings of no sex differences in grouping scores are comparable to those obtained for adult samples. Age comparisons of mean grouping scores indicated that younger and older children did not differ significantly in the number of groups of two or more objects. However, younger children formed smaller groups than older children and gave a greater number of single-object groups, thereby obtaining a greater total-number-of-groups score. A comparison of mean grouping scores of children and adults indicated that conceptual differentiation is greater in children than in adults.

A notable feature of the children's performance in categorizing and defining groups related to the degree of coordination between grouping and verbalization. In comparison to adults, children retained more fluid boundaries for their groups; they relied less on verbal mediation and more on earlier perceptual and motoric contact with objects in defining their groups; and they approached grouping with less conscious verbal control. The writers note: "In spite of their closeness to the stimuli, their coordination is more autistic, less accurate, and less dictated by verbalizable concepts. In effect, their coordination to reality in the limited sense appropriate to such a specific categorizing test, is still not fully articulated and not fully verbalizable" (Gardner and Moriarty, 1968, p. 47).

Several of the findings relating to conceptual differentiation indicate 1) that individual consistencies apparent in adults are also evident in preadolescent categorizing; general lines of development move from narrow categorization toward broad categorization; 2) that qualitative changes occur in the relationship between verbalization and grouping; 3) that the individual consistency defined as conceptual differentiation is independent of the qualitative developmental changes and is probably a relatively autonomous structure.

Category Width

A second stylistic aspect of categorizing behavior has been labelled "category width." Subjects are identified as narrow or broad categorizers according to the range of stimuli they are willing to assign to a specified category. Evidence concerning the relationship between conceptual differentiation and category width remains equivocal (e.g., Gardner and Schoen, 1962; Sloane, Gorlow and Jackson 1963). Pettigrew's (1958) Category Width test is a popular measure of breadth of categorization in adult studies. A factor analysis of the inter-item correlation matrix for the test (Pettigrew 1958) suggested two factors, a quantitative time and speed dimension, and a more general nonquantitative dimension (Pettigrew, 1958). However a study of Messick and Kogan (1965) suggests that the second factor rather than the first may be related to quantitative aptitude. Wallach and Caron (1959) suggested a relationship between broad versus narrow categorization and cognitive risk taking versus conservatism. These proposals were explored by Kogan and Wallach (1964) but the relationships were not confirmed.

Analytic Cognitive Style

Cognitive style has been defined by Kagan, Moss and Sigel (1963) in their studies of children as "a term that refers to stable individual preferences in mode of perceptual organization and conceptual categorization

of the external environment" (p. 74). It is proposed that both the cognitive and affective domains interact in this construct (Coop and Sigel, 1970). Kagan and colleagues have focused upon cognitive styles as modes of information processing. Cognitive activity is viewed as involving at least three sequential processes: the initial categorization of external information, storage of the coded categorization and the imposition of transformations upon the encoded data (Kagan, 1966). Conceptual products, it is suggested, are influenced by the "individual's preferred focus of attention during the initial stages of learning" (Lee et al. 1963). Kagan et al. (1963) propose three basic cognitive styles: analytic-descriptive, relational, and categorical, all of which may be determined by performance on grouping and sorting tasks.

The analytic-descriptive style is characterized by the tendency to group objects on the basis of observable, objective, physical attribute, e.g., "They're all people with no shoes on." The descriptive-analytic individuals in general tend to split environmental stimuli into subunits and to attend to these units as discrete parts. The relational style is represented by a preference for grouping objects on the basis of functional relationship involving spatial or temporal contiguity or on the basis of a thematic interdependence. Each stimulus must relate to other stimuli in order to be included in the group, e.g., "Mother cutting cake for the child." The categorical style is indicated by categorization which is based

on an inference about the stimuli that are grouped together. Any stimulus in the group is an independent instance of the conceptual label.

A basic test procedure in the studies of the Kagan group is Kagan's Conceptual Styles Test. This test consists of thirty stimuli, each containing three line drawings of familiar objects. The subject is asked to select "the two things that seem to go together." The tendency to analyze the stimulus field is termed an analytic attitude.

In a study with the Fels longitudinal sample Kagan et al. (1963) found the following correlates of analytic approach in adults: avoidance of dependency in relations with their families, strivings for intellectual mastery, and concern for social recognition. Kagan et al. (1963) report several investigations of the correlates of an analytic style in children. In a study conducted with thirty-eight sixth-grade boys and thirty-nine sixth-grade girls, preference for analytic concepts on the conceptual style test for boys was associated with the tendency to be analytic in sorts of human figures, to produce noun-noun sequences in a word association test, to avoid functional groupings in organizing words on a serial learning task. Results for girls were less consistent.

Stability of analytic style over a one-year period was high for grade-three girls and moderate for grade-three boys. Stability coefficients for nonanalytic responses were also high for girls ($r = .64$; $p < .001$) and

moderate for boys ($r = .40$; $p < .06$). Age trends for analytic and nonanalytic concepts are linear and indicate that with development, analytic responses gradually increase and nonanalytic responses gradually decrease. At least until the grade six level, boys continue to give more analytic responses than girls.

The relationships between cognitive style and IQ differ for boys and girls and also for verbal and nonverbal IQ measures. For boys, analytic attitude on the Conceptual Style Test was unrelated to scores on the verbal section of the California Test of Mental Maturity but moderately correlated with the nonlanguage score on the same test. In addition a nonanalytic approach was associated with low scores on the nonlanguage scale. Categorical inferential responses for boys, were significantly related to both verbal and performance scores on the California Test of Mental Maturity while for girls, scores, although positive, were not significant (Kagan et al. 1963). Kagan, Rosman, Day, Albert and Phillips (1964) report that an analytic attitude appears in performance on the Picture Arrangement subtest of the WISC but is independent of Vocabulary and Information. Verbal fluency scores for a grade three sample were unrelated to analytic attitude. Sigel, Jarman and Hanesian (1967) found no significant relationships between styles of categorization and Stanford-Binet IQ for five-year-old boys. For five-year-old girls, class-naming,

a subcategory of the categorical-inferential style, was related significantly to the Stanford-Binet IQ.

Lee, Kagan and Rabson (1963) investigated the effect of a preference for analytic groupings on rates of learning analytic, relational or inferential concepts in a concept formation task. Subjects were fifteen high analytic and fifteen low analytic grade-three boys who were identified in a larger group on the basis of scores for the Conceptual Style Test. The findings for the study indicated that analytic boys learned the analytic concepts more easily than the relational or categorical concepts, while nonanalytic boys learned the relational concepts with greater ease. It was suggested that individual differences in the conceptual products of children may be due to individual preferences in the initial processing of information (p. 442).

Recently, investigators using the Kagan, Moss and Sigel construct of style have been concerned with the implications of cognitive style for the teaching-learning process in the classroom. The questions which have been raised and the literature in this area have been reported by Coop and Sigel (1970).

Similarities in the theoretical concepts employed by Witkin et al. (1962), Gardner et al. (1960), have been discussed in literature (e.g., Holtzman, 1965). Wallach (1962), in particular, has called attention to problems associated with the articulated-vague , or analytical-global label.

Summary

In this section consideration was given to investigations of dimensions of cognitive style in adults and children. A substantial body of literature on the cognitive styles field dependence-independence and conceptual differentiation indicates that these styles are consistent and stable aspects of cognitive functioning. While the bulk of the research on cognitive styles has been conducted with adult samples, an extensive investigation of field dependence-independence in children has been completed by Witkin and his group. Gardner has reported an investigation of cognitive control patterns in a group of children aged nine to thirteen. The work of the Kagan group to some extent parallels that of the Witkin group in that it is also concerned with analytical functioning. As a relationship has been postulated between conceptual differentiation and category width, the research relating to the latter construct was considered in the review presented in this study. A number of questions in the literature concerning cognitive styles relate to the clarity of basic concepts. There is a consensus however, that at least particular styles may be of practical importance to education.

thinking, e.g., the similarities in the way a certain word is used by different people" (p. 96). To Lenneberg (1967) concepts are superimpositions upon the physically given; they are modes of ordering or dealing with sensory data. They are not so much the product of man's cognition, but conceptualization is the cognitive process itself" (p. 333).

Vinacke (1952) describes abstracting as "the linking of one sensory experience to another, during which some details are left out and others become dominant ...." (p. 104). Vinacke explains further, "Generalization signifies that the dominant detail (or group details) resulting from abstraction is used as a basis for responding similarly to the separate objects linked by abstraction, and for responding to other objects similarly linked" (p. 104). Vinacke (1952) has described five general characteristics of concepts.

> 1. Concepts are not direct sensory data but something resulting from the elaboration, combination, etc., thereof.
>
> 2. ....concepts depend upon the previous experience of the organism.
>
> 3. Concepts are systems within the mental organization which tie together, or link, or combine discrete sensory experiences.
>
> 4. ... such ties or links are symbolic in nature; that is, the same concept may be invoked by a variety of stimuli. In the human organism, words usually fulfill this symbolic function; a word ties together different experiences with the same object, experiences with different objects somehow related to each other, the emotional processes aroused in these experiences, etc.

II CONCEPT FORMATION

Concept formation has been considered in review articles by Vinacke (1952). Leeper (1951), Russell (1960), Kendler (1961), and Sax (1970), among others. A thorough discussion of definitions has been presented by Hunt (1962). Structural characteristics of concepts have been defined by researchers such as Berlyne (1965), Davis (1966), and Gagne (1966). Klausmeier et al. (1965) have compiled an extensive bibliography of the experimental work in concept learning. The literature on concept formation includes publications by Bruner et al. (1962), Bourne (1966), Klausmeier and Harris (1966) and Kleinmuntz (1967). Conceptualization as an aspect of intellectual development in children has been reviewed by Wallace (1965).

Bourne (1966) suggests that "a concept exists whenever two or more distinguishable objects or events have been grouped or classified together or set apart from other objects on the basis of some common feature or property of each" (p. 1). Kendler (1961) writes that concept formation implies "the acquisition or utilization, or both, of a common response to disimilar stimuli" (p. 447). Harre (1966) describes concepts as the vehicles of thought, the entities by means of which thinking is carried on. "Thinking," Harre (1971) indicates, "is something people <u>do</u> . . . . The word concept may best be understood as referring to certain pervasive traits in the activity of

> 5. On the side of the internal processes of the organism, concepts represent selective factors. An external symbol arouses a symbolic response, on the one hand, or a symbolic response guides perceptual activity, whichever comes first (p. 101).

Vinacke (1952) has also identified three features of concept systems: Concepts have both extensional or denotative and connotative or intensional meanings. Concepts vary in the "consistency" or correctness of their organization; and concepts have both "vertical" and "horizontal" organization (pp. 101, 102).

According to Bruner et al. (1962). "To categorize is to render discriminably different things equivalent, to group the objects and events and people around us into classes, and to respond to them in terms of their class membership rather than their uniqueness" (p. 1).

Two types of categorizing discussed by Bruner et al. (1962) are identity response and equivalence response. Identity categorization is defined as classing a variety of stimuli as forms of the same thing. The capacity for categorization in terms of identity depends upon learning. An equivalence response occurs "when an individual responds to a set of discriminably different things as the same kind of thing or as amounting to the same thing" (p. 4). Bruner et al. (1962) distinguish three broad classes of equivalence categories:

> Affective categories. Grouping depends strongly on whether or not things placed in the same class evoke a common affective response.

> Functional categories. The objects ... fulfill a concrete and specific task requirement--"things large enough and strong enough to plug this hole in the dike."
>
> Formal categories. These are constructed by the act of specifying the intrinsic attribute properties required by the members of a class. Such categories have the characteristic that one can state reliably the diacritica of a class of objects or events short of describing their use (p. 5).

Bruner (1962) points out categories exist as inventions, not as discoveries.

> As a result, the study of equivalence becomes essentially a study coding and recoding processes employed by organisms who have past histories and present requirements to be met. The implicit assumption that psychological equivalence was somehow determined by "similarity" or "distinctive similarity" of environmental events is replaced by the view that psychological equivalence is only limited by and not determined by stimulus similarity.... There is an act of rendering similar by a coding operation rather than a forcing of equivalence on the organism by the nature of stimulation (Bruner, 1962, p. 8).

The utility of categorizing has been described by Bruner (1962) as follows:

> Through categorizing the organism reduces the complexity of its environment.
>
> Categorizing is the means by which the objects of the world about us are identified.
>
> A category based on a set of defining attributes reduces the necessity of constant learning.
>
> Categorization provides direction for instrumental activity.

> Categorizing permits the ordering and relating of classes of events (pp. 12, 13).

Archer (1966) has commented: "It seems that the highest levels of intellectual sophistication are achieved when the organism can with ease reduce the complexity of its environment, and yet at the same time appreciate the subtle differences among the elements within its environment " (p. 47).

Stages in concept formation. Kagan (1966) identifies two principles which govern inquiry into human thinking, i.e., "that concepts are the fundamental agents of work," and that "an individual's conceptual structure passes through different stages over the course of development" (p. 97).

Behavior in concept formation may vary along a dimension of concreteness-abstractness (Vinacke, 1952, p. 125).

Hunt (1961) suggests that the distinction between "abstract thought" and "concrete thought" made by Goldstein (1939) is similar to the distinction that Piaget has made between formal and concrete operations.

Goldstein and Scheerer (1941) refer to the abstract and the concrete attitudes as "capacity levels of the total personality" (p. 1). According to the concrete attitude, "our thinking and our acting are directed by the immediate claims which one particular aspect of the object or of the interworld situation makes" (p. 3). With an abstract attitude, "we transcend the immediately given situation, the specific aspect or sense impression:

we abstract common from particular peoperties; we are oriented in our action by a rather conceptual viewpoint, be it a category, a class, or a general meaning under which the particular object before us falls" (p. 4). Hanfmann and Kasanin (1937) have distinguished three levels of performance on the Vygotsky sorting test, a concrete performance, an intermediate performance showing some aspects of conceptual thinking, and an advanced conceptual performance.

Children's concepts probably change from naive, prelogical, egocentric forms to more moture, logical, objective forms (Vinacke, 1952, p. 120). Thomson (1959) suggests that the acquisition of new basic concepts appears to occur in children until the age of about fifteen years. The development of conceptual behavior in children has been analyzed in terms of Goldstein's formulation by Bolles (1937), Reichard, Schneider and Rapaport (1944), Weigl (1941) and Thompson (1944). Weigl concluded that the conceptual behavior of his sample (children ages four to six) "must be designated as concrete to the highest degree ...." (p. 21). Thompson concluded that her group of children (Grades one to three) demonstrated a type of classification "also concrete but situational and narrative" and suggested that the sorting behavior of Weigl's children may be "an earlier type of concrete behavior" (p. 122). Bolles (1937) found that objects could be classified according to the following types: (a) Identity--Items belong

together by virtue of exact sensory equivalents; (b) Partial identity--Similarly determined but classification rests upon an equivalence of only one sensory attribute; (c) Categorical similarity--Items belong together because they represent a class, not because of similar attributes or antiquity of function. Reichard, Schneider and Rapaport (1944) concluded that there are three levels of conceptual development in the thinking of children: concretistic, which characterizes the thinking of young children; functional, which involves classification in terms of use and reaches its peak in children of eight to nine; and conceptual, the most mature level of thinking.

Vygotsky (1962) has described three basic phases in the development of conceptual grouping in children, as follows: (1) Unorganized congeries or heaps consisting of objects grouped on the basis of vague subjective bonds. The sign (artificial word written on the underside of each figure in the sorting test) is extended to objects linked only by chance in the child's perception. Performance reflects syncretism, the tendency to "merge the most diverse elements into one unarticulated image on the strength of some chance impression" (p. 60). (2) Thinking in complexes in which objects are grouped not only on the basis of subjective impressions but also on the basis of bonds actually existing between objects. The objective bonds are concrete and may include relationships between objects

observed in actual experience. Five types of complexes are noted: associative type, collections, chain complexes, diffuse complexes, and pseudo-concepts. (3) Development of abstraction which progresses from grouping of objects on the basis of maximum similarity (e.g., objects that are red and flat) to grouping on the basis of a single attribute (e.g., only flat objects). The latter formations are termed potential concepts. The abstracted trait in potential concepts is more stable than the trait in complex thinking. "Only the mastery of abstraction," Vygotsky points out, "combined with advanced complex thinking, enables the child to progress to the formation of genuine concepts" (p. 78).

Inhelder and Piaget (1964) noted three basic stages in children's understanding of classification. Children from two to five produce "figural collections" in which objects form a figure in space. Intension does not fully determine the objects in the grouping. Children from five to seven produce hierarchical collections but are unable to comprehend inclusion relations. Children from about seven to eleven can construct a hierarchical arrangement and comprehend inclusion. Inhelder and Piaget (1969) commented, "The understanding of the relative sizes of an included class to the entire class is achieved at about eight and marks the achievement of a genuine operatory classification" (p. 103).

Concepts and words. Vinacke (1952) describes a verbal response as a label for the internal cognitive system (p. 100). Lenneberg (1967). emphasizes the dynamic aspect of the process of labelling. Ausubel (1968) stresses a second important aspect to the role of language in concept formation:

> In the abstracting, categorizing, differentiating, and generalizing aspects of combining and transforming known concepts into new abstractions, generic ideas are not sufficiently manipulable themselves to be handled in these designated ways. It is only because complex concept meanings can be represented by single words that these combinatorial and transformational operations become possible (p.81).

Concepts and reading. Experimental evidence concerning the relationship of concept development to reading is still meagre. However, the trends are significant. Studies by Jay (1950), Kress (1956), Jan-Tausch (1962), Braun (1963) and Wickens (1963) have contributed to knowledge in this area. Jay (1950) identified a factor X3, obtained by the Thurstones' (1941) study of Primary Mental Abilities, as a reading factor requiring classification ability. She concluded that classifying words may be an essential task in reading.

Braun (1963) found that ability in concept formation was more closely related to reading achievement at the fifth and seventh grades than was intelligence. Kress (1956) found that non-readers lacked adequate concepts for dealing with language, exhibited a dependence upon the

physical characteristics of objects, and tended to be concrete in their conceptual functioning. Jan-Tausch (1962) and Wickens (1963) found that good readers were able to abstract significantly better than poor readers.

Concerning abstract and concrete behavior, Vinacke (1952) has asked:

> To what extent is this behavior a function of the organization of concept systems within the mental context? .... Are such characteristics as flexibility, perseveration, and attitudinal factors more significant than the context of concept systems?" (p. 129).

In summary, this section has been concerned mainly with the nature of concepts and with the development of conceptual grouping in children. The stages identified in the concept formation of children reflect the transition from concrete to abstract modes of thought. Experimental evidence on the relation of concept development to reading was considered.

LANGUAGE

The review of language development is concerned with an examination of some of the qualitative aspects of language growth which have been identified in vocabulary, word association, and proverb responses. Werner and Kaplan (1963) have observed that:

> the progress toward autonomy of linguistic mediation--involving an increasing distance and independence

in speech activity. The interpretation of names in terms of other names, e.g., definitions, and the establishment of relationships among names, e.g., relations of analogy, reflect the growing autonomy of the linguistic medium. The following section of the report is concerned with qualitative levels and developmental trends as revealed through analyses of responses of children.

Qualitative Development in Vocabulary Responses

Ervin-Tripp (1966, p. 62) has commented that vocabulary increase is always accompanied by conceptual change. Vocabulary growth is associated with differentiation of categories and with greater complexity in hierarchical and relational structures of knowledge (Ervin-Tripp, p. 62). The following section focuses mainly on vocabulary growth as it reflects the developmental aspects of these activities.

Studies of the nature of vocabulary responses date back to the second half of the nineteenth century. In 1869 a Berlin pedagogical periodical asked teachers of that city to determine concepts possessed by children entering the first grade and called attention to the variation which might be expected between the concept of urban and rural experiences. Hall (1891) presents the findings of the teachers concerning 2,238 children. About 90.26 percent of the children had a concept of "dwelling," about 11.22 percent understood "river," and about 11.96 percent had a concept

> of language from the domain of concrete, perceptual-motor experiences--reflects itself in several ways: increasing reference to phenomena remote from concrete perception, formation of names to refer to class concepts rather than to individual concepts, formation of designators of abstract rather than context--bound relations, etc. (p. 184).

Ervin-Tripp (1966) indicates that changes in the semantic system may include:

> ...increases in the specificity of terms, increases in knowledge or in the concept range, shifts from sensori-motor to relational bases for concepts and shifts in the verbal structure so that antonyms, synonyms, and other structural relations in the vocabulary reflect the critical contrasts employed in the language (p. 64).

The concept of syncresis has been applied by Werner (1961) in a definition of undifferentiated mental functions. Characteristic examples of syncretic activity are concrete and affective thinking which reflect the absence of "a strict separation of thought from perception, emotion, and motor action" (Werner, 1961, p. 213). "It is by means of representation through language and through the naming process," Werner (1961, p. 254) states, "that the human mentality reaches the level of the abstract concept." Abstraction in language may be said to originate "at a stage where language itself is identified with concrete action and where names are fused with objects they denote" (Werner 1961, p. 254).

According to Werner and Kaplan (1963, p. 184) the use of purely linguistic operations for constructing referents and relations among referents is an indication of the growing autonomy of linguistic mediation

of "lark." Hall found the children stating, for example, that oats came from oaks, butter from buttercups, and apples are dug from the ground. The study revealed the vague and half-assimilated concepts which children have of some of the most common objects with which they come in contact.

Barnes (1896) made a comprehensive study of the definitions of children from six to fifteen years of age. Commenting on this study, Werner and Kaplan (1963) have stated:

> His (Barnes') findings present an impressive picture of the ontogenetic decline of definitions formulated in terms of concrete action from 82 percent at the six-year level to 33 percent at the fifteen-year level. It is worthy of note that according to these findings, even in children of ten years of age, more than 50 percent of the definitions of thing-names are still in terms of concrete action (p. 188).

A study of growth in general meaning vocabulary was conducted at the beginning of the century by Chambers (1904). Chambers secured from 2,922 children and young people from five to twenty-seven years of age, answers to the question, "What do you mean by the words 'monk', 'peasant', 'armor', 'nation', 'school'?" An analysis of responses in terms of age levels led Chambers to conclude that a wave of development in word definition was indicated in the following order: no content, wrong content, vague content, correct content.

Many of the characteristic responses of children have been isolated and their developmental levels described as a result of work done in the area of intelligence testing. In 1905 Binet and Simon published intelligence tests which included vocabulary tests of both abstract and concrete words. They made the following three distinctions in classifying definitions of words: (1) silence, simple repetition, or designation by gesture; (2) definition by use only; (3) definition superior to use. They wrote:

> As early as four years half of the children define by use only. The number increases a little at five years.... It is not until nine years as we shall see, that the majority of definitions given are superior to use (p. 205).

Terman and Childs (1912), in a tentative revision and extension of the Binet-Simon Measuring Scale of Intelligence, arranged a test of one hundred words. While a qualitative analysis of vocabulary responses was not done, Terman and Childs (1912) stated, "We believe that a qualitative analysis of the verbatim definitions of children of different ages and mentality would be of great value" (p. 206). In 1916, Terman wrote that types of definitions used by children gave information about the child's apperceptive processes. Analyses of children's responses to the Stanford-Binet Intelligence Scale have subsequently shown differences in quality of definition relating to chronological and mental age (e.g., Marx, 1928;

Green, 1931; Reichard and Rappaport, 1943; Feifel and Lorge, 1950; Kruglov, 1953; Papania, 1954; Russell and Saadah, 1962).

Wechsler (1944) has stated that a test calling for definition of words is often of value because of its qualitative aspects:

> In defining a word a subject gives more than its mere meaning. In many instances he tells a good deal about himself, or at least about the quality and character of his thought processes. (p. 99).

Classification schemes which were developed for use with the Wechsler Vocabulary Subtest and the Binet Vocabulary Subtest have become the foundation for most present day studies of the qualitative level of vocabulary responses. In particular, systematic methods for appraising and extending vocabulary responses have been developed by Gerstein (1949) and Feifel and Lorge (1950). Interest in the qualitative levels of children's vocabularies persists. Recent analyses are those of Wolman and Barker (1965), Lundsteen and Michael (1966), Belmont and Birch (1966), and Weiser (1959). Wolman and Barker (1965) concluded from a study of children age four through twelve that the transition from the "infantile mode" of defining words to the more mature form is gradual and slow, and that sex and intelligence play no important role in the development (p. 165).

Lundsteen and Michael (1966) measured levels of thinking, defined as abstract, functional, and concrete, when the stimulus was the word, the paragraph, and the unfinished problem story. They found that abstract subscores

were closely related across the experimental measures. Weiser (1969) found meaningful qualitative differences in the vocabularies of children of average mental ability and suggested that one of the causes behind the qualitative differences was social and cultural background. In a study of the intellectual profile of normal and retarded readers, Belmont and Birch (1966) found that in general, weaknesses in intellectual functioning for retarded readers were restricted to the Verbal Scale. In an analysis of the quality of definitions used by the two groups of readers, it was found that retarded readers defined more words descriptively and fewer words categorically than did normal readers.

Al-Issa (1969) examined the developmental patterns of concrete, functional, and abstract word definitions of 201 male children ranging in age from five to ten years. Subjects were asked to define thirty words. Results indicated that the mean number of concrete responses decreased from 6.4 at age five to 3.3 at age ten. The mean number of functional responses decreased from 21.5 at age five to 8.3 at age ten. The mean number of abstract responses increased from 2.1 at age five to 18.4 at age ten. Functional responses were the most frequent response up to age nine, while at age ten, abstract responses became the most frequent type of definition. The dominant definition at age five was the functional definition suggesting that functional responses may represent a lower level of cognitive

development than the concrete or abstract responses. Results indicated that the development of word definition after age five is a gradual and continuous process.

Current interest is focusing on the relation between cognitive structures and language structures (e.g., Sinclair 1970). In a recent study, Clark (1971) investigated the acquisition of the meaning of the temporal conjunctions "before" and "after" by children three and five years of age. Clark suggests that "the child only partially learns the meaning of new words--he learns some of its semantic features--and later he adds to this knowledge as he finds out more about what the word means" (p. 266).

The interdependence of various language abilities was explored by Mehrabian (1970). Mehrabian (1970) assessed the verbal ability of 127 nursery school children ranging in age from thirty to sixty months. He found considerable consistency in performance across measures of vocabulary, comprehension of commands, inflection, judgment of grammaticalness and imitation. His findings suggested that the various abilities measured formed an interdependent system in early childhood.

An area of investigation with implications for language concerns the child's comprehension of similarity and difference. A study on equivalence formation with verbal materials has been reported by Olver and Hornsby (1966). Children from ages six to nineteen were given the task of telling how

different items are alike. Items in one array were banana, peach, potato, meat, milk, water, air, germs, stones. The words were presented one at a time and subjects were required to indicate the way in which each new item was different from and similar to the items which preceded it. Five main modes of response were distinguished: the perceptible (equivalence is based on qualities such as color and size); the functional (equivalence is based on use of items); the affective (equivalence in based on emotions which the items arouse); nominal (items are grouped by giving them a name that exists ready-made in the language) and fiat equivalence (a statement is made that items are the same). Six-year-olds were found to group more often in terms of perceptible properties than did older children. Functionally based equivalence increased from forty-nine percent of all responses at 6 to 73 percent at age nineteen. The writer commented:

> It may well be that as a child breaks away from the perceptual domination of vivid things he must fall back on a more practical way of dealing with the environment through action or at least vicarious action. The common uses of things are pitted against their divergent appearances, and the conflict promotes growth (p. 73).

Three general grouping structures were identified: superordinate (groups were structured on the basis of a common feature); complexive (groups were formed by using attributes of an array); thematic (items were grouped according to their fit in a sentence or story).

Younger children tended to form their groups complexively.

For example, "Banana and peach are both yellow, peach and potatoe are round." Older children, on the other hand tended to group superordinately, for example, "They are all food." Concerning the patterns of growth observed in children the writers concluded:

> To begin with there is a massive change that takes place between the sixth and nineteenth year .... At six, half of the groupings made by the children are complexive, half superordinate. By nine, the balance shifts to three-quarters superordinated. And by nineteen, the complexive grouping has virtually disappeared, at least among these subjects and in this culture (p. 77).

In a second experiment on equivalence ninety boys from six to eleven were presented with pictorial stimuli. Results indicated that the use of perceptible attributes declined from 47 percent at age six to 27 percent at age eight to 20 percent at age eleven. In addition there was an increase in superordinate constructions from 34 percent at age six to 69 percent at age eight to 85 percent at age eleven. Thirty-one percent of the groupings of six-year-olds consisted of the grouping of two items in a sentence (e.g., "The bunny ate the carrots," p. 83) The use of such sentential structures declined to 20 percent for eight-year-olds and to 8 percent for eleven-year-olds. The writers suggested, "It would seem that for the young child the sequential form of the sentence is a powerful determinant of connections between things, while for older children other aspects of language become more instrumental in thought--for example,

form class" (p. 83). This change in equivalence was viewed as consistent with the shift from syntagmatic to paradigmatic responses in word association reported by Ervin (1961) and by Brown and Berko (1960).

In reporting comparative study of equivalence in North American suburban children and rural Mexican children using the Olver-Hornsby (1966) procedure, Maccoby and Modiano (1966) described the development of North American children as follows:

> ....the North American child starts out by seeing objects in terms of perceptible and concrete characteristics, but he soon begins to consider them in the light of what he can do with them. Also, he starts to pay attention to abstract qualities and to similarities between objects. At first he may note the "goodness" or "badness" of things, repeating culturally determined labels; but later, as he reasons more, the good objects are those useful to man. By the age of eleven or twelve, seven of ten North American children, in contrast to none of ten Mexicans employed concepts such as these. At best the North American child develops an interest in theory, in the abstract equivalences and differences among objects. At worst he merely manipulates things in a formal and increasingly reductionist manner (p. 261).

Word Association

This section considers changes in the associative behavior of children over time and the effects of particular variables upon associative responses.

The study of word association has a long tradition and derives from an interest in the nature of human thought. A large part of the history

of the empirical study of associative responses reflects clinical interest in the responses of adults and the clinical application of the word association test in the diagnosis of associative disturbances. The period from 1950 to the present signals a time of renewed interest in word association characterized by the use of the association test in investigations of verbal behavior and conceptual tasks (e.g., Johnson, 1964).

Reviews of word-associative studies have been presented by Levy (1956), Rapaport et al. (1946), and Woodworth and Schlosberg (1954), among others. Deese (1966) has provided a critique of classical association theory and has reviewed the history of the empirical study of association. Cramer (1968) has written a comprehensive review of word association studies published between 1950 and 1965 and has presented a detailed analysis of task and subject variables.

Research on the word association of children has been reviewed in early studies by Rusk (1910), Woodrow and Lowell (1916), and in more recent reports by Palermo (1963) and Entwisle (1966). Norms for children's free word associations have been published by Palermo and Jenkins (1964) for children in grades four to eight, ten and twelve; and by Entwisle (1966b) for children from kindergarten, and first, third and fifth grades. Norms for children's restricted association have been published by Riegel (1966). Current interest in the association responses of children is centered in part on the relationship between word association and linquistic competence.

Rusk (1910) was the first investigator to provide data on the association of English speaking children. He employed the visual presentation of a series of five free association and six constrained association tests of ten terms each with a sample of twenty-two boys age seven and one-half to fourteen and one-half. The series of free association tests contained either concrete terms (e.g., boot) or abstract terms (e.g., praise). The constrained associations were administered to find (a) a superordinate concept, (b) a coordinate concept, (c) causal relations, (d) the whole for a given part, and (e) the part for a given whole. Rusk found no direct relation between speed of association and age. Speed of association did increase with practice with greater effect for abstract terms. The order of difficulty for the various associative processes, judged by response time, ranged as follows with the less difficult items first: whole-part, part-whole, coordination, free concrete, super-ordination, sub-ordination, free abstract, and lastly, causal relations.

A broad normative study, based on the association of 1,000 children in the fourth and fifth grades of the Minneapolis Public Schools, was reported by Woodrow and Lowell in 1916. Entwisle (1966b) points out that this study provided the only extensive data on children's responses prior to 1964. A shift in content of responses was noted with children's responses following a sequential pattern and adult responses following a replacement pattern. In contrast to adult associations, children's responses contained more verbs,

verb-object, noun-adjective, adjective-noun, pronouns, sound similarity and whole-part responses. Adults, on the other hand gave more contrast, superordinate, coordinate, part-whole, noun-abstract attribute, participles and cause-effect responses. The responses of the two grade groups were similar. Differences in responses due to test procedures were interpreted as of minor consequence by the authors (Palermo, 1963).

Few reports on children's word associations were published in the period between the Woodrow-Lowell study and the early 1960's (Palermo, 1963). In 1963 Palermo and Jenkins reported the norms for a large sampling of school-age children. Several aspects of the data analysis have been documented by Palermo (1963).

The subjects in the Palermo and Jenkins (1963) study were 250 males and 250 females in each of grades four through eight, ten and twelve, and five hundred male and five hundred female college students. The tests included the Kent-Rosanoff list of one hundred words plus a list of one hundred additional words chosen on the basis of frequency of occurrence in the language of children and young adults. Subjects read the stimulus words and wrote their responses. Results indicated that the mean percentage of the most popular response was smallest for the lowest grade groups but increased with age for both males and females. At all grade levels females tended to give the five most popular responses more frequently than males. An analysis of the number of different responses given to each stimulus word

indicated a decrease in the mean number of different responses with age. At the same time, females gave fewer different responses on the average than males. These data were interpreted as offering support for a hypothesis that "more linguistically advanced or experienced persons tend to strengthen particular associations among words as a function of their experience, which is reflected in their responses to a word association test" (Palermo 1963, p. 44).

Differences in responses as a function of age were further analyzed in terms of grammatical and semantic classifications. Findings are included in the report by Palermo (1963) and in a report by Palermo and Jenkins (1963). Results for the entire age range indicated an increase in the frequency of subordinate responses from grade four to grade six and then a steady decline to the college level. Males gave more superordinate responses than females. Data for the combined fourth and fifth grades were compared with those of the Woodrow and Lowell sample. Subjects in the Palermo-Jenkins sample were found to give a significantly greater number of superordinate responses. The greater linguistic sophistication of the Palermo-Jenkins sample was interpreted in terms of the increasing linguistic sophistication of the culture. An analysis of the semantic category of opposites, revealed an increase with age from a mean of 21.5 percent at grade four to a mean of 38.3 percent at the college level. Females at each level gave a higher percentage of opposites than males. An analysis of the five most

frequent responses in terms of grammatical classes indicated that paradigmatic responses predominated for all age groups. Again upward trends were noted, and twelfth grade subjects gave more paradigmatic responses than fourth grade subjects for all grammatical classes except adjectives. Differences were not as substantial for nouns and pronouns as for other parts of speech.

Entwisle (1966b) has established a set of word association norms for a group of children, ages four to eleven. Her basic normative sample, numbering 1,160 subjects, was composed of students from pre-kindergarten, kindergarten, first-, third-, and fifth grades. Tests were administered to the group in individual interviews according to oral procedures. An additional group of eighty fifth-grade subjects received a group test. Control variables were age, sex, and for the first time in an association study, intelligence and socioeconomic status. The test list contained ninety-six words selected according to form class and level of frequency. Comparison data were gathered from a college sample of one hundred males and one hundred females. The results of this extensive study are included in preliminary reports by Entwisle, Forsythe and Muss (1964), Entwisle (1966a), and in the major report by Entwisle (1966b). The two main purposes of the investigation were the study of language acquisition over the period of middle childhood through the analysis of association data, and

the establishment of association norms for a middle-childhood group. Central findings relate to the change from a syntactic to a paradigmatic type of response in early childhood and to a clarification of the nature of the change. Syntactic responding was found to be at its peak at the kindergarten-first year level, with a decrease occurring particularly between the first and third grades. The earliest or most immature type of association, evident in the data of four-year olds, was the noun response. Entwisle (1966b) suggests that the child first learns what follows what (the phase of syntactic responding) and then what substitutes for what (the phase of paradigmatic responding). The different characteristics of the syntactic responses of children compared to the syntactic responses of adults was noted. The sequence of development of association responses may be noun, syntactic response, paradigmatic response, and a different syntactic response, but "only a small proportion of the vocabulary may evolve through this pattern at any particular age" (Entwisle, 1966b, p. 120). Thus at first grade level, fewer syntactic responses were given for nouns than for other parts of speech. Syntactic responses for adjectives dropped from 40 percent at the first grade to 18 percent at the third grade, with little change occurring between the third and the fifth grades. Verbs follow a slower trend of development than adjectives, while the evolution of adverbs with age is slower again. By the fifth grade the percentages of syntactic response for nouns, verbs, and adjectives are fairly close.

Entwisle (1966) has concluded "One principle or the other, paradigmatic or sequential, is governing the production of most responses by the fifth grade." IQ differences were most notable at significant points of change.

The effects of intelligence were not the same from one age to another or from one class to another, and became less prominent with increasing age. Thus by the fifth grade an asympote close to 80 percent for paradigmatic responding to adjectives appeared to hold for low-, medium-, and high-IQ groups.

The differences associated with sex were small. Findings indicated that the developmental rate for paradigmatic responding is the same for boys and girls except for a slight acceleration favoring girls at ages four and five. However college females in the sample gave more paradigmatic responses than college males for all form classes except pronouns. Also, a difference in contrast responses to adjectives at both the fifth and college levels, favored females.

Differences associated with socioeconomic status of two urban samples were small. However significant rural-urban differences were obtained. Effects of IQ were noted.

As one aspect of the investigation Entwisle (1966b) studied the development of conceptual clusters through the inclusion of a "butterfly" group of words which had been studied by Deese (1961, 1962). Association

data for each age group were reduced through factor analysis and emerging associative structures determined. Results for the urban sample indicated structures that became more differentiated with age. New factors emerged for older groups as lists of subordinates separated out and clusters became tighter.

Psycholinguists have shown that analysis of responses on a word association test can provide evidence about aspects of the language functioning of children. Entwisle (1966b) points out that Brown and Berko (1960) have provided the major rationale for the study of children's associations as a means of studying linguistic growth (p. 7). Brown and Berko (1960) found that the tendency for children to give homogeneous responses in free association is strongly related to their ability to determine the correct grammatical class of a new word and to use it correctly in a sentence. Ervin (1961) studied changes with age in the free-associations and controlled-choice associations of groups of children in kindergarten, first, third, and sixth grades. The proportion of paradigmatic responses was found to increase significantly with age. There was a decrease with age in the number of multiple word responses. The frequencies of transitional verbs as response to words increased with age, while the frequencies of adjectival responses to nouns decreased. Clang associates declined from an average number of 8.33 per child in the youngest group to an average of 1.62 per child in the sixth grade. Findings were analyzed with reference to

a theory of associations based on training by forward contiguity in speech.

A number of studies on word association have demonstrated that subjects often adopt a characteristic response set or response style (e.g., Carroll et al. 1962; Nunnally, et al. 1963). Moran et al. (1964), and Moran and Swartz (1970) have investigated the tendency to give specific semantic classes of associates. Moran (1964) has stated:

> To the extent that an individual is consistent in the use of one or another specific principle (e.g., contrast or similarity) in mediating stimulus response (SR) word connections one may speak of his characteristis associative set (1964, p. 1).

Moran, Melford and Kimble (1964) investigated the response sets or idiodynamic sets of a group of adult males in an individual testing procedure. Three factors were interpreted as representing distinctive modes of response. The first factor, termed functional, reflected the behavior of subjects with an object-referent set. Their characteristic responses involved "object-object," "attribute-object" and "attribute-on-object" connections. A determinant of response behavior may be a "concrete denotative attitude toward words in general" (1964, p. 11). The second factor, Synonym-Superordinate, reflected a conceptual-referent set in responding word connections appeared to be based in logical relationships. The authors hypothesized that subjects reflecting this set may have an "abstract, conceptual attitude toward words in general." (1964, p. 11). The third factor, Contrast-

Coordinate, was interpreted as representing a speed set according to which the subjects felt constrained to reply as quickly as possible.

An examination of commonality scores in terms of type of set indicated that a subject tends to give more primary responses to stimuli which are compatible with his set. Moreover, a subject tends to commit more mediation faults in stimulus words that are incompatible with his set, may also influence the grammatical form of a response. An object-referent set resulted in many noun responses, the conceptual-referent set in verb responses, and the speed-referent set in adjective responses. This investigation included a similar analysis of the responses of schizophrenic subjects. Schizophrenic subjects obtained lower scores than normal subjects on the structural variables but higher scores on the mediation fault variables. The same three response sets which were identified for normal subjects were operative for schizophrenic subjects on the day of testing. However, a weakening of set in subsequent testing was observed.

The identification of response sets was confirmed in a series of studies with samples of college freshmen (Moran, 1966). A fourth response set, perceptual-referent, was identified. This set reflects the tendency of individuals to give predominantly adjective responses to noun stimuli and noun responses to adjective stimuli. The predication variable loaded highest at the opposite pole of the contrast-coordinate factor.

Moran and Veldman (1967) explored the relationship between an object-referent set and performance on several tests of verbal ability in a pilot study involving one hundred twenty-three college freshmen. Persons with an object-referent set characteristically respond to the stimulus word with a functional associate, i.e., an associate related to the stimulus word in terms of experiential contiguity. Frequency of functional associates for the total sample was not significantly correlated with scores on any of the verbal tests. However fifteen object-referent subjects made significantly lower scores than the other 108 subjects on specific measures of verbal ability. It was concluded that "the presence of an object-referent set may reflect an attitude toward words that also is related to general linguistic competence."

Moran and Swartz (1970) assessed the stability of idodynamic sets with three samples of children from an urban, middle class background. The vocabulary test from either the Wechsler Intelligence Scale for Children or the Wechsler Adult Scale was administered to each subject. Association responses were scored according to three main semantic categories, dimension-referent, perceptual-referent, concept-referent, and two grammatical categories, syntagmatic and paradigmatic. As samples of boys and girls did not differ significantly in mean frequencies of scores or in distribution of set types, analyses were based on combined samples. On the basis of the results of the first test, subsamples representing

each of the three semantic sets were selected at each age level. An analysis of standard scores indicated that the semantic sets (dimension-referent) of the subsamples were stable over the two-year period at all three age levels. The experimenters concluded:

> It appeared that, at least from age nine years, these individual differences in association tendencies may be investigated as reasonably stable features of cognitive dictionaries (p. 23).

While associative sets were reliable over time, subjects with a specific set, on retest, frequently gave their set-representative associates to different stimulus words. In view of the instability of word pairs the writers suggested that "the enduring features of a cognitive dictionary are not best represented as stable hierarchies of specific word affinities" (p. 27) but rather:

> Given knowledge of the structure of an individual's cognitive dictionary (i.e., the enduring differential probabilities of dimension--, perceptual-, or concept-referent associations), the (word) association processes of that individual become very predictable.

Masters (1969) tested the hypothesis that a reduction in syntagmatic word associations and functional word definitions. Analyses of variance disclosed strong age effects for the decline of syntagmatic responding and functional definitions.

Shepard (1970) examined word association and definition in later childhood with a group of fourth, sixth, and eighth grade subjects.

Association responses were rated as syntagmatic if they differed in form class from the stimulus word, or if they frequently followed the stimulus word in natural language. Results demonstrated no correlation between syntagmatic associations and functional definitions.

Word association and cognitive style. Word association and cognitive style have been investigated by Kagan, Moss and Sigel (1963) Rosman (1962) and Kagan, Rosman, Day, Albert and Phillips (1964) in their studies of the implications of a preference for analytic categorizations in children.

Kagan, Moss, and Sigel (1963) have presented data for a series of investigations conducted at the third, fourth and sixth grade levels. In the sixth grade study, thirty-eight boys and thirty-nine girls from different cities were administered a battery of tests which included a conceptual style test, a 40- item word association test, a test of serial learning, and a figure sorting test. Findings for the word association test related to three response categories: noun-noun sequences, noun-not noun sequences, and noun-verb phrase completions. Results for boys indicated that an analytic approach on a conceptual style test is significantly related to the production of noun-noun sequences on a word association test but negatively correlated with the production of noun-verb phrase completions and noun-not noun sequences. The findings were interpreted to indicate that analytic boys

demonstrate a categorical approach in their free associations to nouns. The number of inferential responses on the conceptual style test was not related to noun-noun sequences, although the inferential score was significantly correlated with IQ. A nonanalytic approach in boys was associated with a tendency to produce noun-verb phrase completions. Grade six girls demonstrated no strong relationships between performance on a test of conceptual style and performance on a word association test. As the results for girls were generally less consistent than those for boys, the investigators concluded, "It would appear that analytic responses are of different significance for boys and girls... " (p. 87). A study conducted with twenty-six boys and twenty-nine girls in the third grade included the conceptual style test and a word association test as test instruments. The word association test was composed of 22-count nouns and eight adjectives. A nonanalytic attitude in boys (high in function concepts on the conceptual style test) was associated with the production of noun-verb completions on the word association test. Relationships for girls were not significant.

Forty-six children from the original grade three sample were re-tested one year later when they were in grade four. The test battery included the conceptual style test and a 40-word association test. The three response categories noun-noun, noun-not noun, and noun-verb phrase completion showed higher stability for girls than for boys. The

correlation between a nonanalytic attitude in boys and the use of noun-verb phrase completions which was significant in grade three, was still significant in grade four.

Word association tests were utilized in an investigation in the series reported by Kagan, Rosman, Day, Albert and Phillips (1964). The series represented further explorations of the correlates of an analytic attitude. A group of thirty-two first-grade boys and thirty second-grade boys were administered a battery of tests including Word Association Test, Conceptual Style Test, and four subtests of Wechsler Intelligence Scale for Children (Vocabulary, Information, Picture Completion and Picture Arrangement). The response variables of major interest to the study were coordinate nouns, coordinate verbs, and antonyms. The tendency to produce these three response types was moderately related to analytic attitude, particularly at the second-grade level. A comparison of response frequencies indicated that grade two subjects gave significantly more coordinate nouns, coordinate verb, and antonym responses than first grade subjects. Coordinate nouns, coordinate verbs and antonyms were significantly correlated with each other. Data relative to the coordinate noun responses were also reported by Rosman (1962). The production of noun responses at the grade one level was not significantly related to intelligence. At the grade two level coordinate noun scores were significantly related to

Information scores and to Picture Arrangement scores. The correlations with the Vocabulary score were -.05 at grade one and .00 at grade two (Rosman, 1962).

Verbal achievement and associative response. Tobiessen (1964) has investigated the relationship between children's verbal achievement and associative response. He compared scores obtained on tests of language skills with associative-response scores. For boys in grades four and six, significant correlations were obtained between language scores and the number of paradigmatic responses, the number of contrast responses, and the number of adult primary responses. None of the correlations was significant by grade eight, but by grade ten, all three had increased to significance again. With the exception of paradigmatic response scores at grade four, associative response measures and language scores for girls were unrelated.

Kjeldergaard and Carroll (1963), in a study of high school students examined the relationships between twenty-six verbal tests and two types of free association scores. One score was the number of opposites given to a subset of twenty-one opposite—evoking stimuli in the first fifty words of the Kent Rosanoff list. The other score was the number of nonopposite Primaries given to the remaining twenty-nine stimuli in the first half of the list. Analysis of data yielded two different correlational patterns. Verbal

ability showed a low but significant positive relationship with nonopposite, primaries, while correlations between verbal ability and opposite responses were generally close to zero.

Theories. Clifton (1967) has reviewed two theories which account for word association data in terms of linguistic structure. One, a mediation hypothesis, draws upon structural linguistics, "especially its emphasis on the intersubstitution possibilities of the members of word classes" (p. 221). The second theory, a generative theory, is based on modern generative grammar and states that "words will be found to be associates of each other if they have large subsets of features in common or if the contextual features of one word match the inherent features of the other" (p. 233).

McNeill (1970a) has distinguished two hypotheses regarding aspects of semantic development of a word dictionary in children, viz; an hypothesis of horizontal development and an hypothesis of vertical development. The horizontal hypothesis suggests a sequential entry of items in a dictionary such that not all the semantic features of a word enter the dictionary when the word itself enters. Thus the vocabulary of children of different ages may have different semantic properties. "Semantic development then consists of horizontally completing the dictionary entries of words already acquired as well as new words" (p. 116).

McNeill further points out:

> If we think in terms of distribution classes--i.e., in terms of words that can appear in the same contexts we can say that a child has distribution classes wider than those of an adult. The result of horizontal semantic development is a narrowing of distribution classes..... (p. 117).

The vertical hypothesis suggests that the dictionary entries of a word are complete but the semantic features are separated from each other. Semantic development consists of "vertically collecting these separate occurrences into unified semantic features" (p. 116).

Proverbs

The Oxford Dictionary of English Proverbs (1948) notes two original sources of proverbs: the connonsense statements of the common man, and the reflections of the wise man or oracle (viii). French (1951) describes proverbs as a measure of verbal comprehension. Verbal comprehension is defined as "a factor embodying the knowledge and understanding of the English language. Vocabulary is, of course, basic, but the comprehension of whole sentences or paragraphs is also a function of this factor" (p. 245).

Gorham (1956) considers his Proverbs Test to appraise level of abstract verbal functioning and points out that even with subjects as young as the fifth grade, the request to tell the meaning of a proverb stimulates the "abstract attitude." The process of explaining a proverb in generalized terms is compared to Goldstein's (1944) characterization of abstraction. Goldstein (1936) has stated:

> ... in the abstract attitude we are not directed toward an individual object but toward the category of which that individual thing represents itself as an accidental example and representative of the category. Therefore, we call this attitude also the categorical attitude (p. 305).

Brattemo (1961) explained the implications of "abstract right" and "concrete right" choices on a proverbs test as follows:

> An abstract right interpretation implies that the patient has grasped the symbolic meaning of the proverb and has formed an analogy from the concrete context in such a way that the resulting statement is logically connected with the proverb. In a concrete right interpretation the proverb is understood as a factual statement; the patient adheres to the "here-and-now" character of the proverb but fails to abstract its significance as such (p. 343).

Church (1954) suggests that an abstract attitude towards proverbs indicates that the content is viewed as an ideal, timeless event; apprehension is in terms of hypothetical states. The concrete attitude assumes that the proverb contains information about real events. Accordingly, content is evaluated in terms of its compatibility with concrete reality, i.e., the child agrees with it, he denies it, or he comments on it. Pikas (1966, p. 82) refers to the proverb as "...one of the most promising areas for further investigations in 'abstractness.'"

Proverb interpretation has been used as a tool in the mental evaluation of adults, in the study of thinking, and in clinical diagnosis. Benjamin's list of proverbs published in 1942 provided the impetus for

the use of proverbs in psychiatric evaluation. The use of the proverb in the clinical setting is reviewed by Gorham (1960).

While research on the interpretation of proverbs by children is limited, the studies which are available indicate that proverb-tests provide effective measure of the individual's ability to operate upon language. Subjects were asked to match proverbs with sentences which expressed the thought of the proverbs in new forms. Generally the children did not understand the proverbs although they thought they comprehended them. In addition they often found sentences which they believed corresponded with the proverbs they failed to understand, a process Piaget attributes to verbal syncretism. Until about age seven or eight the child's thought reflects the consequences of egocentrism, and in particular of syncretism. After the age of seven to eight, signs of syncretism may disappear from the child's perceptive intelligence; however verbal syncretism appears in the child's verbal intelligence. Piaget establishes evidence for syncretism of understanding and a syncretism of reasoning through the examination of protocols. Syncretism of understanding means "that the whole is understood before the parts are analyzed, and that understanding of details takes place--rightly or wrongly--only as a function of the general schema (p. 162)." Syncretism of reasoning occurs in the materials collected "whenever a proverb is compared to a corresponding sentence, not because of any

logical implication contained in the text, but because of a general schema in which the two propositions are united (p. 148)." Another characteristic of the child's thought is the need for "justification at all cost costs." Piaget concludes that

> ...the desire for justification at any price is a universal law of verbal intelligence in the child and that this law itself is derived from the syncretistic point of view everything is related, everything is connected to everything else, everything is perceived through a network of general schemas built up of imagery, of analogies of detail and of contingent circumstances, makes it quite natural that the idea of the accidental or the arbitrary should not exist for the syncretistic mentality, and that consequently a reason should be found for everything. On the other hand, syncretism is the outcome of childish ego-centrism, since it is the ego-centric habits of thought that induce the child to fly from analysis and to be satisfied with general schemas of an individual and arbitrary character (p. 160).

Watts (1944) reports that a test of fifty proverbs and idiomatic phrases was administered to approximately 1,800 children ranging in age from eleven to fourteen years. Subjects were required to match each statement with one of four literal statements that followed it. Watts notes that both age and experience would seem to affect test performance. The average score for boys increased from 16.1 at eleven to twelve years to 23.9 at thirteen to fourteen years. Girls achieved an average score of 17.1 at age eleven to twelve and an average score of 27.1 at age thirteen to fourteen. An analysis of errors indicated that when children were in

doubt they selected the most literal statement. Choice of statement was sometimes influenced by the presence of a word which had appeared in the proverb, or by the power of the proverb to produce emotional reactions.

A developmental study of proverb definitions was carried out by Richardson and Church (1959) with sixty-four children aged 7:4 to 12:5. Subjects were asked to give the meanings of seven common proverbs. For purposes of comparison the same proverbs were given to thirty adults between the ages of fourteen and sixty-seven years. One purpose of the study was a clarification of shifts in cognitive functioning; a second was the establishment of a set of scoring categories. The scheme of analysis of data was concerned mainly with the way in which the subject understood the task (rather than how he understood the proverb); and (b) proverb comprehension. Analysis of responses indicated that younger children, rather than follow instructions to define a proverb, assume a variety of task orientations. The proverb for them is "something to be analyzed and explained rather than something to be taken for granted and reacted to" (p. 177). This orientation results in efforts to dispute or justify the proverb, in statements of agreement or disagreement in explanations of the situation represented by the proverb and the purpose served by the proverb. Thus to the proverb, "Every cloud has a silver lining" a subject age seven years, eleven months responded "Because it's made of thin air?"

The proverb, "Don't cry over spilt milk" was interpreted by a subject age eight years, six months as, "Just wipe it up." However, a consistent use in orientation toward the task as one of definition occurs with age with a significant increase in definition responses noted between age group nine years to nine years, eleven months and age group ten years to ten years, eleven months. The nature of proverb comprehension also shifts with age as a tendency to concrete specification gives way to general interpretation. Literal interpretations decrease and there is a corresponding increase in mixed-literal and metaphorical interpretations. Pronounced differences in proverb comprehension were observed between the nine-year-old group and the ten-year-old group. The trend toward more mature interpretation was apparent in adult responses. Immature forms of response persisted in adult protocols but with decreased frequency.

Church (1954) utilized three pairs of mutually contradictory proverbs in a developmental study of children's awareness of verbal contradictions and their methods of resolving them. The subjects were one hundred boys ranging in age from eight years, eight months, to thirteen years, eight months with a measured intelligence of one hundred or higher. The three pairs of proverbs were: (1) Absence makes the heart grow fonder. Out of sight out of mind. (2) Forgive and forget. Revenge is sweet. (3) Everything comes to him who waits. The wheel that squaks gets the grease. Several

conceptions about development were basic to the study. Development was conceived as proceeding from the global to the articulated, from a narrow to a broad span of apprehension, from concrete to abstract, and from rigidity to flexibility. Degrees of maturity from global to articulated were described as follows:

> For the mature individual, a statement consists of words relatively fixed meanings, bound together in a unit according to certain principles of logic and grammar. The less mature individual, on the other hand, tends to perceive a statement physiognomically, in terms of diffuse meanings and with less regard for the relationships which join words in a sentence (p. 2).

Test procedures for the study required the subject to define each of the proverbs, to reconcile the contradictions between the pairs of proverbs, and finally to define the proverbs again. Results indicated an increase with age in the recognition of verbal contradictions, in the number of solutions attempted, and in the number of solutions classified as superior. The number of standard interpretations to proverbs showed a fairly steady increase with age. The number of interpretations obtained when subjects were asked to redefine the proverbs ranged from thirty-eight for the youngest group (eight years, eight months to ten years, zero months) to eighty-four for the oldest group (twelve years, nine months to thirteen years, eight months). Commenting on the difficulties younger subjects had with the relationships within proverbs, Church (1954) stated:

> The younger subjects tended to respond to words or phrases with little awareness of the clear relation of these elements to the totality of the context in which they occur. The total meaning of the proverb is built up from one or two key terms which in themselves are often global and holophrastic or syncretic. For example, "Out of Sight, out of mind: might be interpreted as "Someone who doesn't think good, isn't right in his mind, should be kept out of sight, put away somewhere." Or "forgive" might mean both "pardon" and "apologize." ...For the older subjects, on the other hand, the relationships were better articulated and the meanings of linguistic elements were more stable (p. 56).

Younger children tended to be more rigid in their interpretation than older children. Also the responses of younger children were frequently concrete, i.e., the proverb was defined in terms of a person, an action, or situation rather than as a universal statement. Of interest is the performance of children in the group defined as intermediate (age level ten years, one month to eleven years, three months). These subjects were significantly more variable in their solution methods to the verbal contradictions than were the youngest and oldest children. The intermediate children, it was noted, attempted solutions to contradictions which were not immediately clear to them. Thus in comparison with younger children who may not perceive a problem at all, they are aware of discrepancies although they may not be able to cope with them successfully.

Several studies on figurative language have related directly to children's work in the classroom (e.g., Flaum, 1945; Holmes, 1959;

Groesbeck (1961). These studies generally show that elementary school children possess a great number of misconceptions about figurative language.

Summary

The studies on vocabulary, word association and proverbs indicate that there are characteristic differences in the quality of response, and that growth with ages recurs in the level of response. The linguistic activity of the child in the early stages of defining or of interpreting proverbs is concretely contextualized, while word associations generally follow a syntagmatic pattern. In studies of word definition responses were generally classified according to concrete (descriptive), functional, and abstract categories. Abstract responses were the most frequent responses by age ten. Cross-sectional studies of vocabulary indicate that qualitative difference occurred in the vocabularies of children of average mental ability. Abstract qualities of thinking were related when the stimulus was the word, a paragraph, and a story. Developmental studies of the grammatical form class of associative responses indicate a shift from a syntagmatic to a paradigmatic type of response. Supraordinate responses increase until the grade six level, then decrease. Differences associated with sex are small while different form classes are affected by intelligence at different ages levels. Distinctly different response hierarchies have also

been identified. Age patterns for proverb interpretations indicate that for young children proverbs represent a specific event or happening rather than a general statement. Proverb responses also reveal a "syncretism of understanding" which is associated with egocentric habits of thought. The studies under review investigated language functioning in terms of qualitative levels and form the theoretical basis for the analysis of language differentiation carried out in the present study.

IV. SUMMARY

This chapter was concerned with a review of the literature related to cognitive style, specific aspects of concept formation, and particular characteristics of language development. Part one included a discussion of the nature of cognitive style. The historical antecedents of the cognitive styles field dependence-independence and conceptual differentiation were reviewed and research relevant to these styles was examined. Cognitive styles were described as relatively autonomous aspects of cognitive organization which represent unique ways in which the individual comes to interact with his world. For example, field dependence is associated with the tendency for experience to be diffuse and global while field independence is associated with the tendency for experience to be delineated and structured. Both field dependence-independence and conceptual

differentiation reflect individual differences in development of differentiation. Field independence is manifestation of a broader dimension of functioning termed psychological differentiation. Psychological differentiation implies a single developmental process. Conceptual differentiation is regarded as an aspect of concept formation inasmuch as it reflects a dimension of individual differences evident in the categorizing behavior of adults and children. The development in conceptual differentiation would appear to proceed from the formation of small groups in an object-sorting task to the formation of large groups. The findings concerning field dependence and conceptual differentiation suggest that these cognitive styles may be related to different forms of differentiation.

Part two of the review of the literature was concerned with a definition of concept formation. Conceptualization was described as a process. Words were described as labels for an underlying categorization process. Efficiency in concept formation has been correlated with field independence. Conceptual differentiation, however, in adults, at least, is unrelated to capacity to abstract or to the individual's preferred level of abstraction.

Part three of the review was concerned with language development in children as revealed is the qualitative aspects of vocabulary,

word association and proverb responses. Developmental progression in language is from the global to the articulated style. Level of development was interpreted as a reflection of the way in which the child experiences the world around him. Whether cognitive style has a bearing on the relation of input to language growth is open to question. Because the development of cognition is tied to the development of language, the same factors may be expected to influence each.

CHAPTER IV

DESIGN OF THE STUDY

The purpose of the study was an exploration of the relations among reading, language, and cognitive style. The present chapter contains a description of the design and the analytic procedures used. Included are a discussion of the sampling procedures and measuring instruments, and a listing of the null hypotheses tested.

I. POPULATION AND SAMPLE

The population for the study was sixth-grade children in the Edmonton Separate School District, Edmonton, Alberta. All subjects were drawn from schools in similar middle-class communities. To approach homogeneity of socio-economic level, schools of a homogeneous community background were identified by the Supervisory Staff, Elementary Division, Edmonton Separate Schools. Twelve schools, containing a total of 21 grade-six classes were chosen to participate in the study. A random selection of 12 grade-six classes was made from the set of 21 grade-six classes. Three hundred and sixty-two subjects were identified through this procedure. All pupils in the sample were tested on a reading comprehension test. Raw scores were tabulated and the extremes of the distribution

eliminated from the sample. The total possible score for the reading test was one hundred. Extremes were defined in terms of raw scores below sixty-five or above ninety-five. According to this procedure all students who were below the seventh percentile rank or above the ninety-eighth percentile rank on the Van Wagenen Analytical Reading Scales were excluded from the study.

As the next step, a random selection of seventy-five students was made from the remaining group of 315 students. These subjects were screened for word recognition. A minimum grade score in word recognition of 6.0 was established. Any subject not meeting the conditions of the word recognition test was excluded from the sample and another subject was selected randomly to take his place. Further tests were then administered including a reading test, two cognitive style tests, two language measures, a measure of intelligence and a measure of spontaneous flexibility.

The sixth grade level was chosen because pupils at this level may be expected to be advanced in the skills of comprehension. They are also psychologically at an age when abstract thinking and reasoning are possible.

There were seventy-five students in the original sample, thirty-five girls and forty boys. Of the seventy-five subjects in the sample, three subjects did not complete all test materials because of absences and were excluded from the study. The final sample of seventy-two subjects included

thirty-four girls and thirty-eight boys. A description of the sample is presented in Table I.

TABLE I

CHARACTERISTICS OF THE SAMPLE

Test Group	Number of Pupils	Average Chronological Age in Months*
Boys	38	142.97
Girls	34	141.95
Total	72	142.49

*Age was measured to the nearest month as of May 1.

II. THE MEASURING INSTRUMENTS

The section which follows is concerned with a description of the instruments employed, the rationale of the tests, and the nature of the test scores.

Screening Procedure

A control test was used to identify those subjects whose low scores in comprehension were due in an identifiable part to difficulties in word

recognition. In the present study, The Schonell Graded Word Reading Test for Ages 5 to 15, Form A was used as a screening device. The test represents a scientifically selected sample of one hundred words of increasing difficulty and provides an estimate of a pupil's power to recognize words which are presented out of context. The pupil is required to read the words orally. The test results are expressed in terms of a Reading Age. The test was administered to all subjects according to prescribed procedures (Schonell and Schonell, 1950). A Reading Age of 11.0 was considered adequate for the purpose of the study.

Language Measures

Language differentiation was measured by three tasks. Performance was assessed through procedures which allowed for an analysis of content in terms of developmental differences. The following instruments were selected.

Proverb test. There is general agreement in the literature that proverbs are excellent measures of an individual's ability to generalize from the concrete to the abstract. In addition, studies of proverb responses indicate developmental progression in proverb interpretation over the childhood years.

As pointed out in the Oxford Dictionary of English Proverbs "many proverbs have not a precise, invariable, and generally known and accepted form" (p. v). The forms adopted for the present study were those used by Richardson and Church (1959).

"The mature metaphor," Richardson and Church (1959) state, "consists of a concrete analog of a general proposition, an analog not limited to the clearly figurative terms but including their relational context as well, making for a statement whose literal meaning, at least, is fairly unequivocal" (p. 177). Church (1954) has reported that the interpretation of common proverbs works quite well with the children as young as eight.

The Proverbs Test was administered individually by the investigator. Subjects were asked to give the meaning of seven proverbs. The proverbs were read aloud and once testing had begun, it continued in sequence from the first proverb through the seventh proverb. Administration procedures followed those developed by Richardson and Church (1959). The proverbs used were:

An ounce of prevention is worth a pound of cure.	(Ounce)
Don't cross your bridges until you get to them.	(Bridges)
Every cloud has a silver lining.	(Cloud)
All that glitters is not gold.	(Gold)
Don't cry over spilt milk.	(Milk)

Where there's smoke there's fire. (Smoke)

You can't teach an old dog new tricks. (Dog)

The specific criteria that had been observed in selecting this set were that the proverbs be in widespread use and that they be phrased figuratively rather than literally (Richardson and Church, 1959).

The following instructions were given:

> I have a list of proverbs here. Do you know what a proverb is? Well, it's an old, old saying. What I want you to do is tell me what you think each saying means. I'm going to write down what you say so I can remember it. There's no right or wrong answer--all I want to know is what you think they mean.

The proverb was repeated as often as necessary. Following Richardson and Church's (1959) procedures, the word "prevention" was defined on request. Otherwise no help was given beyond encouragement not to give up.

Proverbs were scored according to the following procedures:

The first evaluation of proverbs was for correctness of response. Gorham's (1956) 3-point scoring system was adapted for use as follows:

Points	Response
2	Correct interpretation of proverb expressed in general statement.
1	Partially successful response.
0	Incorrect or inappropriate interpretation.

- "Is this proverb true (or valid)?" E.g., Smoke.

  "Yes, there always is." Unelaborated "Yes" and "No" responses were classified in this category.

- Why (or how do we know, or under what conditions) is this proverb true (or valid)? E.g., Cloud.

  "Because the cloud is white." Responses in this category frequently begin with the word "because."

- How can we explain the situation represented by the proverb? E.g., Milk.

  "Don't waste your time looking at it. Clean it up."

- What function does the proverb serve? E.g., Ounce.

  "So you'll take the medicine the doctor gives you."

2. Proverb Comprehension. The S's understanding of the proverbs was scored according to two dimensions; (a) Specific-General-Dimension and, (b) Literal-Figurative Dimension.

(a) According to the Specific-General Dimension, proverbs were classified as either General Statement or Concrete Specification. The term General Statement is self-explanatory, since virtually all proverbs can be reduced to the form, "Given a situation of Type A, then event "A" ensues; i.e., they are general statements of antecedent-consequent relations. Several degrees of generality of interpretation are possible, but any response which refers to a class of events, no matter how narrow, is scored

Samples from the children's responses are as follows:

Proverb: All that glitters is not gold.

2-point score:	Everything that may appear to be good is not.
1-point score:	It could look good on the outside.
0-point score:	Steel in sunshine glitters.

The number of "omits" was determined for each subject.

A second evaluation of proverb interpretations followed the scheme of analysis developed by Richardson and Church (1959). All responses were scored regardless of the correctness of response. Richardson and Church (1959) suggest that these scoring categories allow consideration of the qualitative features of responses and at the same time exhaust most of the information contained in the responses. The following set of scoring categories was utilized:

1. Task Orientation: This term refers to the way in which the subject understood the request, "What I want you to do is tell me what each saying means." Responses were categorized according to one of two orientations.

Definition:	The response was formed to say what the proverb means.
Other:	The response was designed to answer questions such as the following:

are doing something don't do it before you get to this thing'" (Richardson and Church, p. 173).

Metaphorical responses are those in which "the literal meanings of the proverbs' key words appear" (Richardson and Church, p. 173).

In a third evaluation of the test, proverbs were scored for abstractness on a five-point rating scale. All responses were analyzed. The scoring system was developed in the course of examination of student protocols. Ratings were assigned as follows:

Points	Response
4	Apprehension in terms of a timeless proposition. Most mature response.
3	Apprehension in terms of a timeless event. A lesser degree of maturity evident.
2	Apprehension mainly in terms of concrete reality but with some perception of possibility in contrast to actuality.
1	Apprehension in terms of a concrete happening or personal experience.
0	Repetition of proverb.

An example of a proverb with scoring samples from children's protocols is presented below.

as General Statement (Richardson and Church, 1959, p. 172). The Concrete Specification rating was applied to those responses in which a proverb is interpreted as describing a particular person, thing, attribute, situation, or event, almost as though the proverb were a picture caption or a story title or synopsis. E.g., Cloud ... "Maybe it's a man that has a silver lining in his coat" (Richardson and Church, 1959, p. 172).

An additional scoring rule was followed in connection with this category. Interpretations such as Dog, "It's hard for the dog ... cuz he's so slow and old," although demonstrating a tendency toward a concrete attitude, were scored, according to a conservative scoring policy, as general statement.

(b) According to the Literal-figurative dimension, S's understanding of metaphor was scored in terms of the categories Literal, Mixed Literal and Metaphorical, and Metaphorical.

Literal response represents acceptance of the words of the proverb at face value. E.g., Fire ...."When flames go higher they make smoke."

Mixed Literal and Metaphorical responses are those in which "the proverb is given a metaphorical meaning but certain literal elements remain, as in Gold ..., "Everything you see that is shiny doesn't mean it is worth a million dollars." Also included in this category were vague responses "having so low a degree of specificity that their position in this dimension is wholly indeterminate. E.g., Bridges ... 'If you

Proverb: Don't cry over spilt milk.

4-point score:	Don't regret missed opportunities.
3-point score:	If you've made mistakes don't be upset about them.
2-point score:	If something happens, don't cry over it.
1-point score:	I shouldn't cry if I spill something.
0-point score:	If you spill your milk, don't cry.

A mean Proverb Rating score was obtained for each subject by averaging scores for all responses.

A total of six proverb scores was obtained for each subject. The categories are listed as follows:

Proverbs Correct	Proverbs Omit
Definition--Other	General Statement--Concrete Specification
Proverb Rating	Literal--Mixed Literal--Metaphorical

Word association test. The Word Association Test consists of forty words in the following categories--twenty count nouns, ten adjectives, and ten transitive verbs. The test is included in the Fels Cognitive Style Test Battery and was described by Kagan et al. (1963) and Rosman (1962).

Writing about word association studies, Rommetveit (1968) has stated:

> A large number of such studies have shown that frequency of paradigmatic responses increases steadily with level of language acquisition. A considerable part of such responses are synonyms, opposites and

> and superordinate or coordinate class associates of the stimulus word, and thus occurrence may accordingly be interpreted as evidence for the differentiation of a successively more abstract sphere of reference out of an initial matrix of a fused, referential, associative, and emotive pattern (p. 170).

Subjects were tested in an individual-oral situation. A single-word response was obtained for each test item. The instructions were the following:

> I am going to say a word out loud. You tell me the first word that comes into your mind as quickly as you can.

The response was noted by the examiner. If the child was unable to respond in thirty seconds, the examiner proceeded to the next stimulus word. If a child was obviously "preparing" his response word before hearing the stimulus words, he was told, "Wait until you hear my word before you think of your word."

Two qualitative measures were used to assess the relationships between stimulus and response word: Grammatical Category, and Semantic Classification. A description of the response categories follows. In the analysis according to Grammatical Category responses were first scored according to a classification based on a syntagmatic versus a paradigmatic dichotomy. Syntagmatic associates are words which form a sequential pattern with the stimulus word, (e.g., "throw"--"ball"). They generally

7. Adverbs, prepositions and conjunctions following verbs were rated as syntagmatic.

8. Nouns and pronouns following transitive verbs were judged as syntagmatic when they formed meaningful sentences. E.g., Stimulus word: give. Response: flower.

9. Verbs preceded by "to" when given as responses to verb stimuli were judged as syntagmatic. E.g., Stimulus word: begin. Response: to eat.

The test scores were the total number of responses in the syntagmatic and paradigmatic categories respectively.

Responses were next classified by form class. The correspondence between the form class of the stimulus and the form class of the response was determined. The number of responses that matched the form class of the stimulus was tabulated separately for nouns, verbs and adjectives. The score for the total number of matching responses was also obtained.

In the analysis according to Semantic Categories, responses were categorized according to the following stimulus-word associate patterns:

(1) Noun-Coordinate Noun
(2) Noun-Supraordinate Noun
(3) Adjective-Antonym
(4) Whole-Part relationships

A description of the categories follows. Definitions follow those of Moran et al. (1970); Kagan et al. (1964) and Flavell et al. (1961):

Noun-Coordinate Noun. The response word is a term which is a member of the same class or category as the stimulus word. The stimulus and response may be defined by a label supraordinate to both words. E.g., spoon-fork.

occupy different grammatical positions in the language from the stimulus word. Paradigmatic associates are responses of the same form class as the stimulus word, (e.g., "jump"--"leap"). Criteria for syntagmatic associations followed those established by Entwisle (1966b, pp. 45-47):

> 1. Whenever the stimulus word was repeated with a word preceding it, the association was classed as syntagmatic. E.g., Stimulus word: table. Response: baby table.
>
> 2. A noun followed by another noun was classed as syntagmatic when a clear syntactic association was evident. E.g., Stimulus word: flower. Response: garden.
>
> 3. A verb following a noun was classed as a syntagmatic association when the verb could be predicate of a simple sentence, having the noun as subject. E.g., Stimulus word: hand. Response: pick.
>
> 4. An adjective following a noun was judged as a syntagmatic association when (a) the response was an adjective that normally precedes the stimulus noun. E.g., Stimulus word: hand. Response word: second, and (b) a meaningful simple sentence could be obtained if "is" were inserted between the stimulus word and the response word. E.g., Stimulus word: river. Response: rocky.
>
> 5. Conjunctions, articles and possessive pronouns, when given as responses to noun stimuli, were classified as syntagmatic.
>
> 6. Nouns following adjectives were classified as syntagmatic when the pattern noun "is" adjective formed a meaningful simple sentence. Following this criterion some pronouns, prepositions and prepositional phrases were rated as syntagmatic.

Noun-Supraordinate-Noun. The response word denoted a class or category of which the stimulus word's referent is an immediate member. E. g., chair-furniture.

Adjective-Antonym. The response word contrasts with the meaning of the stimulus word in one or more ordinary and appropriate contexts. E.g., dark-light.

Whole-Part. The response word refers to part of an object denoted by the stimulus word. E.g., tree-branch.

In addition, data were examined for rhyme and clang associations. As there were few responses in these categories, the scores were not included in the statistical analysis of the data.

Vocabulary. The Wechsler Intelligence Scale for Children was administered to all subjects in the study as a measure of intelligence. The Vocabulary subtest of the WISC was administered with a qualitative analysis of protocols as a specific objective of the testing program. The WISC was administered according to the directions in the Wechsler Intelligence Scale for Children, (Wechsler, 1949) .

The WISC Vocabulary subtest is a word list consisting of forty items. The WISC Manual (1949) indicates that testing should be discontinued after five consecutive failures (responses scored 0) . For the purpose of this study the examiners determined whether the subject knew the meanings of words beyond this point. Responses beyond the point where five consecutive words were failed did not receive credit in the quantitative scoring. A

complete set of responses to the first ten words of the Vocabulary Subtest was obtained for all subjects. Quantitative scoring of the Vocabulary subtest was completed as part of the scoring of the complete test battery. The scoring principles were those recommended in the Wechsler Manual (Wechsler 1949) and in the supplemental scoring guide, WISC Scoring Criteria, Scoring Supplement for the Wechsler Intelligence Scale for Children (Massey, 1965) .

Following the quantitative scoring of the Vocabulary subtest items, all of the protocols for the forty items of the Vocabulary Subtest were rescored in terms of a qualitative classification system. Scorable responses for the total sample were not all derived from the same words. However, most subjects gave correct responses to the first ten words of the Vocabulary Subtest. Therefore, in addition to the qualitative analysis of responses to the forty items of the Vocabulary Subtest, a separate analysis of the quality of definitions of the first ten words was carried out.

Analysis was completed according to the following procedure:

1. The definition for each word of the list for each student was copied on a separate card. Each student was given a code number which was placed on the back of the card for identification purposes.

2. The definitions were then sorted according to the word defined, that is, all the responses to the word "umbrella" for example, were put together.

3. Definitions for each word were then classified according to type of response.

Wechsler (1958) has stated, "A test calling for definitions of words is often of value because of its qualitative aspects" (p. 85). The qualitative analysis of responses in the present study was based on an adaptation of Feifel and Lorge's (1950) classification system. Selected categories were enlarged according to Rick's (1958) elaboration of Feifel (1949) rating scheme. Gerstein's (1949) description of conceptual levels for Wechsler-Bellevue vocabulary responses was also used as a guide in the preparation of the classification scheme. The following classification system was used:

Synonym Category

a. Synonym unmodified:

Single word response	Spade - a shovel
Multiple word response	Fable - story with moral
Response with nonspecific object (someone, something)	Join - connect something

b. Synonym modified by use: Spade - tool used in garden

c. Synonym modified by description: Diamond - valuable jewel

d.	Synonym modified by use and description:	Bicycle - two-wheeled vehicle you ride
e.	Genus or species:	Sword - a weapon
f.	Antonym negated:	Brave - not cowardly

Function Category

Function:	Umbrella - that's for going out in the rain.

Description Category

Description:	Diamond - it's expensive

Function and Description

Function and Description:	Hat - it covers your head and it's warm.

Responses which received a zero score in the quantitative analysis of protocols were rated according to five categories chosen from Fiefel's (1952) qualitative classification system. The scoring categories are listed below.

Error Category

Misinterpretation:	Belfry - the boy who brings your suitcases
Wrong Definition:	Nuisance - funny
Clang Association:	Affliction - a conflict

Repetition without explanation:	Spangle - spangle
Omission:	A definition is not given

Reliability of scoring of language measures. The reliability of the scoring was established through interscorer agreement. Ten cases in each of the areas, vocabulary, word associations, and proverbs, were randomly drawn and rescored by independent raters.

Agreements were computed in terms of percentages through the Arrington (1932) formula:

$$\frac{2 \times \text{agreements}}{2 \times \text{agreements} + \text{disagreements}}$$

The percents of agreement for the vocabulary tests were found to extend from 96 to 100 percent. The percents of agreement for the word association tests extended from 97 to 100 percent. Agreements for the proverb tests extended from 90 to 96 percent. By standards considered acceptable in the studies reviewed, the scoring of the language measures appears to be satisfactory.

Reading Measures

Different ways of measuring reading comprehension may produce varying estimates of ability. Two types of reading tests were utilized in

this study: one an objective multiple-choice test, and the second a measurement which allowed for free response.

Van Wagenen Analytical Reading Scales, Intermediate Division, Form M. The Van Wagenen is a multiple choice test which provides a measure of reading comprehension. It presents a total of one hundred tasks with twenty tasks in each of five phases of reading ability identified by the author. These phases are described as follows:

Central Thought	the ability to see what paragraphs are mainly about.
Simple Details	the ability to notice details stated in the paragraphs.
Related Ideas	the ability to see the more complex ideas expressed in groups of two or more sentences.
Inferences	the ability to go beyond the statements in paragraphs in forming inferences.
Interpretation	the ability to interpret the content of paragraphs or to see the qualities that characterize the scene, the actions or the characters of individuals portrayed in the paragraphs.

In the present study the test was administered by the investigator in two periods. Each pupil was given one copy of the Scales and one answer sheet. Pupils were given sufficient time to complete the tasks.

Responses were scored by hand.

The test provides a total measure of reading comprehension ability and also a separate measure in each of the five phases of reading named. Raw scores were utilized in the present study. Six scores were derived: the total number right on the 100-task scale, and the numbers right on the five 20-task subscales.

Coefficients of reliability are not provided in the test manual.

Inter-test correlations for the subscores of the Van Wagenen were obtained in the pilot study. The results are presented in Appendix E. The subscores correlated highly with the total test score while most inter-test correlations were somewhat lower. A decision was made to include the subscore tests in the analysis of the data.

The Narrative Test. This test was adapted by the investigator and allows for free responses by the students. The test consists of a prose passage entitled, "The Avenger" followed by a set of comprehension questions. The selection was chosen from the book Understanding and Enjoyment, Book I, Oxford Comprehension Course (Martin, 1954). The book was designed for eleven-year-olds and the passages in it have been selected and graded as the result of a classroom experience. Concerning the nature of the selections, the Introduction to Understanding and Enjoyment (Martin, 1954) states:

> Among the threads which contribute to the total meaning are character, tone, cause and effect, emotions of various kinds, relationships to others ideas, and above all the general significance of theme as opposed to mere plot (p. ix).

Comprehension activities involved two tasks: (1) Part I involved a retelling of the story. Subjects were instructed to "Tell the story in your own words." (2) Part II consisted of a set of comprehension questions, all but one of which were selected from the text, Understanding and Enjoyment (Martin, 1954). Selection of questions was preceded by a delineation of the skills and processes of reading as presented in the literature. The set of questions contains both restricted response and extended response items.

The questions were tested with sixth grade subjects comparable to those for whom the test was designed.

Part I of the Narrative Test explored the subject's ability to grasp the underlying theme of the narrative. Concepts basic to the analysis of responses to Question One, were:

1.	Integration	the degree to which each composition integrated or assimilated the theme of the story.
2.	Translation	comprehension behavior according to which each subject put the communication into other language and other terms.

Questions in Part II of the test tested ability to comprehend figurative language, to recognize facts, to detect sequence, to make interpretations and to draw inference.

A copy of the test is presented in Appendix C.

Students recorded their responses to the Narrative Test on a test form. In order to make appraisal of responses as dependable as possible and to reduce subjectivity in grading, a scoring sheet was developed. Preparation of the scoring guide was directed in part by Strang's (1956) scale of freely written answers, the maturity scales presented by Gray and Rogers (1956), and by Paul's (1959) analysis of the way people reproduce stories. A preliminary model was prepared by the examiner and used in the appraisal of a sample of test papers. The scoring scheme was then modified in the light of these answers. The sheet was also used by another rater for scoring and agreement was reached on procedures. The scoring scheme was then used to assign credits to each question in turn. Papers were graded anonymously. An additional rater gave an independent rating of responses to a random sample of ten test papers. Inter-judge agreement on the sample was .92. A copy of the scoring guide is presented in Appendix C.

The reliability of the narrative test was determined through a test-retest procedure with a time interval between test administrations. Ninety pupils were tested in this procedure. A reliability coefficient of .85 was

obtained. Construct validity was established through correlation with an outside criterion, the Gates Reading Survey, Form C. The Narrative Test correlation with the vocabulary Grade Score of the Gates Reading Survey was .62; the correlation with the Comprehension Grade Score of the Gates Reading Survey was .65. These correlation coefficients characterize the Narrative Test as a stable instrument of adequate validity.

Intelligence Measure

As reading achievement tends to be related to intelligence at all academic levels, and as the literature poses a number of questions on the relation between intelligence and cognitive style, the Wechsler Intelligence Scale for Children (WISC) was administered to all subjects. The WISC is a downward extension of the Wechsler Bellevue Intelligence Scale used with adolescents and adults. The underlying theoretical assumption is that a test of general intelligence measures not only a general g factor but in addition a set of unspecified group factors.

The WISC Manual contains tables of intercorrelations as well as reliability coefficients and standard errors of measurement for the sub-tests and for the Verbal, Performance and Full Scale IQ's. Most of the verbal tests correlate better with each other than with tests of the performance group and vice versa. Correlations of the Verbal Score with the Performance

Scores at the three age levels of seven years six months, ten years, six months and twelve years, six months are .60, .68 and .56 respectively. The reliability coefficients quoted for the WISC are split-half coefficients. Coefficients of reliability and standard errors of measurement are reported for ages seven years, six months, ten years, six months and thirteen years, six months, with split-half coefficients in the .80's and .90's reported for the Verbal and Performance sections and reliabilities in the .90's for the Full Scale (Wechsler, 1949) .

No validity figures for the test are quoted in the Manual. However, a large number of research studies have been aimed at validating the WISC and a considerable literature has accumulated. Littell in a review of a decade of research (1960) has provided an account of the literature prior to 1958. Reviews of the validation studies are also contained in reports by Patterson and Rabin in the Fifth Mental Measurements Yearbook and Burstein in the Sixth Mental Measurements Yearbook (1965) .

In the present study the WISC was administered to all subjects in the sample. The Verbal Score was obtained by adding Scaled scores for the following subtests: Information, Comprehension, Arithmetic, Similarities and Vocabulary. The Performance Score is the sum of the Scaled Scores of the following tests: Picture Completion, Picture Arrangement, Block Design, Object Assembly, and Coding.

The Full Scale Score was the sum of the Verbal Score and the Performance Score and was based on the ten tests listed.

Cognitive Style Measures

Two clearly defined styles were tested, field dependence-independence, and conceptual differentiation. A description of the tests follows.

Embedded Figures Test (EFT) . This test provides an operational index of the cognitive style field dependence-independence. The Embedded Figures Test is a standardized test for determining the ease with which perceptually embedded simple figures may be found in a complex field. Witkin (1950) chose eight simple figures and twenty-four complex patterns which had been developed by Gottschaldt (1950) and added colour and a memory task. Each complex pattern contains one of the eight simple figures. The task of the student is to locate the simple figure within the larger complex figure. For some subjects the simple figure almost "pops out" of the complex pattern. Their perception is field independent. Other subjects find it difficult to overcome the influence of the complex design and cannot find the simple figure in the time allowed. Their perception is field dependent. Most subjects fall between the two extremes of performance.

The test is suitable for ages ten and over. A set of instructions is

provided for use with children. Basic instructions and essential information are contained in Witkin's paper, "Individual Differences in Ease of Perception of Embedded Figures" (1950) . The Embedded Figures Test is a frequently used measure of cognitive style.

A striking range of difference has been found among subjects. Gough (1965) interprets the findings of the Embedded Figures Test as related to (a) field independence, (b) cognitive clarity, (c) an analytic versus global perceptual mode, and (d) a general disposition to articulate and structure experience.

Reliability coefficients for the Embedded Figures Test are high. Witkin et al. (1962) reported a reliability coefficient of .91 for a sample of 81 ten-year old boys and a reliability coefficient of .92 for a sample of twenty-three, seventeen-year-old boys. Studies contributing to construct validity of the concept that performance on the Embedded Figures Test reflects extent of psychological differentiation include studies relating EFT performance to nature of body concept (e.g., Faterson and Witkin, 1970), and studies relating EFT performance to differences in family experience (e.g., Corah, 1965).

Object Sorting Test. Gardner (1953) has defined object sorting as the criterion test of conceptual differentiation. Procedures for the present

study were based partly on those developed by Wallach and Kogan (1965) in their adaptation of the Clayton-Jackson (1961) Object Sorting Test. The latter, a paper and pencil test consisted of the names of fifty familiar objects. Selection of the names for objects in the Clayton-Jackson study had been based on the following two criteria: (a) the objects were specific, generally moveable ones with a definite location; (b) the objects could not easily permit more than one meaning. For the present study, the fifty words were translated into pictorial form. The test, as constructed, consisted of a line drawing of each of the fifty familiar objects on a separate card. Listed below are the items comprising the Object Sorting Test.

a fork	a door	a tire
a scissors	a T.V. set	a spoon
a cigarette	a spool of thread	an arrow
a lamp	a flashlight	a flower
a clock	a lipstick	a rake
a jacket	a screwdriver	a wallet
a letter	a sled	a hanger
a refrigerator	a hammer	a pot
a canoe	a rug	a golf club
a comb	a shoe	a chair
a baseball	a cup	a pistol
a hat	a pencil	a lamppost
a purse	a candle	a ruler
a glass	a book	a watch
a tree	a stool	

The ease of identification of the pictures was tested in the pilot study. Three pictures were redone as a result of the pilot work and the items were retested.

The administration procedures and scoring systems in the present study were basically those of the Gardner [e.g., Gardner and Schoen, (1962)] group.

Test items were presented in a fixed random order. Before testing was begun subjects were asked to examine each picture and accuracy of identification was determined.

Following the rationale of Gardner et al. (1959) and Sloane (1959) procedures which would encourage spontaneous categorizing behavior were followed in order that categorizing preferences would become apparent. Subjects were instructed to group the pictures in the way that seemed "most natural, most reasonable, and most comfortable":

> First of all I want you to know that there is no answer to this test. Everyone does it his own way. I want you to do it in the way that seems most natural, most reasonable, and most comfortable to you. The instructions are simply to put together into groups the objects which seem to you to belong together. You may have as many or as few objects in a group as you like, as long as the objects in each group belong together for one particular reason. If after you have thought about all the objects, a few do not seem to belong with any of the others, you may put those objects into groups by themselves. Please sort all the objects (Gardner et al. 1959, Sloane, 1959).

Four grouping scores were derived:

1. The total-number-of-groups score which was used as a criterion of conceptual differentiation. This score included all the groups of two or more objects, plus objects left by themselves.

2. The number of single objects score.

3. The number of groups of two or more objects.

4. The average number of objects per group in the groups of two or more objects.

According to scoring procedures each object left by itself was scored as an additional group when inquiry indicated that the subject considered the object to be unrelated to any of the other objects.

Subjects high in conceptual differentiation (or according to early literature, subjects with "narrow" equivalence range) were narrow categorizers, i.e., they tended to place objects in many small groups in the free categorizing situation.

Subjects low in conceptual differentiation (subjects with "broad" equivalence range) were broad categorizers, i.e. they tended to organize objects into a few large groups in the free categorizing situation.

Following their sorting, subjects were required to define each group of two or more objects. The defintions were used as a basis for determining the total number of groups. When a definition indicated clear subdivisions in the basis for grouping, each of the subdivisions was counted as a separate group. The reasons given by subjects for their groupings were assumed to reflect preferred level of abstraction and were analyzed in order to determine the conceptual level of the S's verbalization. Each definition of two or more

objects was scored as concrete (C), functional (FD), or conceptual (CD) according to the scoring scheme described by Rapaport, Gill and Schafer (1945) and elaborated upon by Kaplan, Colarelli, Gross, Leventhal, and Siegel (1970).

The scoring categories, Concrete, Functional and Conceptual are described below:

> The Concrete Definition (C) defines the grouping in terms of a concrete attribute which the objects have in common, e.g., picture, television set and book are grouped together because "they all have color in them." Included in this category are also (a) overinclusive syncretistic responses referring to location, origin, or "the belonging to something or someone" e.g., "All belong in the kitchen," "they belong in the forest," "two things you would find outdoors," "they all belong to men." (b) Items linked in a setting because of their concrete uses, e.g., "you take food out of the refrigerator and cook it in the pot," "You use the key to open the door." (c) Thematic references, e.g., "You could read a book and then you could watch T.V."
>
> The Functional Definition (FD) defines a group of objects in terms of a function they have in common or in terms of a common function performed with them or on them, e.g., "Both decorate a room." "You can paddle in both." "Something you would use in school."
>
> The Conceptual Definition (CD) expresses an essential characteristic of the objects in a generic term, e.g., "furniture," "plants," "sports equipment."

Concrete, functional, and abstract definitions were assigned preferred level of abstraction ratings of 1, 2, and 3. A mean Level of

of Abstraction score was obtained for each subject by averaging the scores for all definitions.

The percentage of Conceptual, Functional, and Concrete definitions was determined for each subject. The percentage of combined Conceptual and Functional definitions was also determined.

Data on reliability are available for object-sorting tasks administered to adult groups. The test-retest correlation coefficient for the number of groups formed in Gardner's Object Sorting Test, with a three-year interval between administrations, was .89 (Gardner and Long, 1961). Sloane, Gorlow, and Jackson (1963) report a correlation of .75 between alternate forms of a group-administered paper-and-pencil version of Gardner's Object Sorting Test. Correlations between the paper-and-pencil object sorting tests and Gardner's (1953) Object Sorting Test were .53 and .55.

To establish reliability of the level of abstraction scores, randomly selected cases were rescored by an independent rater. Agreement was computed by the Arrington (1932) formula whereby the responses in each observer's scoring that agree with the other's (in effect doubling the agreements) is divided by this total plus the disagreements (responses dissimilarly recorded)

$$\frac{2 \times \text{agreements}}{2 \times \text{agreements} + \text{disagreements}}$$

The range of the percents of agreement for the sample was found to extend from

94 to 100 percent. The degree of correspondence between the scorers indicates that the scoring was carried out in a consistent manner.

Spontaneous Flexibility

This factor involves "the ability or disposition to produce a diversity of ideas in a relatively structured situation" (Frick, Guilford, Christensen, and Merrifield, 1959). It is a divergent variable dealing with the production of classes. Messick and Kogan (1963) suggest that low Spontaneous Flexibility may be correlated with inability to conceive relative categories for grouping. Frick, Guilford et al. (1959) state that the Brick Use test is almost a pure test of the spontaneous flexibility factor.

The Brick Uses Test required the students to "list within five minutes as many uses as you can think of for a brick." One score was obtained from the test, the number of categories of usage employed by the subject.

Testing Procedures for the Study

The administration of procedures, with the exception of the intelligence test, was conducted by the investigator and a school psychologist. Twenty of the intelligence tests were administered by three clinicians. All examiners involved in administering tests were trainees of the same Clinic. In all, nine procedures were administered: two procedures were administered

as group tests and seven procedures were administered individually.

Testing was initiated in mid-April. Data collection for the final sample began on the first of May and continued each day for approximately six weeks.

The standardized group reading test was administered by the investigator to an entire class in their home rooms. All other testing was performed outside the classroom either in small groups or individually. The cooperation of the school staffs made it possible to administer the tests under highly favorable testing conditions.

Test periods were approximately one hour in length. Care was taken that pupils did not become fatigued and no further testing was done on the days on which either the intelligence test or a reading test was administered.

A classification of the instruments employed in the study is presented in Table II. The tests are listed according to sequence and method of administration as follows:

	Test	Test Administration
1.	Van Wagenen Analytical Reading Scales, Intermediate Division, Form M, Grades 4-6.	Group
2.	The Schonell Graded Word Reading Reading Test for ages 5 to 15, Form A	Individual

TABLE II

CLASSIFICATION OF INSTRUMENTS

Area	THE MEASURING INSTRUMENTS		
	Title	Classification	Scores Derived
Reading	The Schonell Graded Word Reading Test for Ages 5 to 15, Form A	Word Recognition	Reading Grade Score
	Van Wagenen Analytical Reading Scales, Intermediate Division M	Reading Comprehension	Central Thought Simple Details Related Ideas Inferences Interpretation Total Score
	Narrative Test (N)	Reading Comprehension	Narrative Test Score
Language	Proverbs Test	Language Differentiation	Proverbs Correct Proverbs Omit Definition Other General Statement Concrete Specification Metaphorical Response Mixed Literal and Metaphorical Response

TABLE II (continued)

Area	THE MEASURING INSTRUMENTS		
	Title	Classification	Scores Derived
Language (continued)	Proverbs Test	Language Differentiation	Literal Response Proverb Interpretation
	Word Association Test (WAT)	Language Differentiation	Syntagmatic Response Paradigmatic Response Noun-Coordinate Noun Noun-Supraordinate Noun Adjective-Antonym Whole-Part
	Vocabulary Sub-test, Wechsler Intelligence Scale for Children	Language Differentiation	First Ten Items Synonym V10 Function V10 Description V10 Function and Description V10 Total Function-Description V10 Error V10 Forty Items Synonym V40 Function V40 Description V40 Total Function-Description V40

TABLE II (continued)

Area	THE MEASURING INSTRUMENTS		
	Title	Classification	Scores Derived
Language (continued)	Vocabulary Sub-test, Wechsler Intelligence Scale for Children	Language Differentiation	Forty Items (continued) Error V40 Omission V40 Wrong Definition V40 Clang Association V40 Misinterpretation V40
Cognitive Style	Embedded Figures Test (EFT)	Field Dependence-Independence	Number of Minutes Taken to Complete Test
	Object Sorting Test (OST)	Conceptual Differentiation	Number of Groups of Two or More Objects Number of Single Objects Number of Groups (Single Objects as Separate Groups) Average Number of Objects (Excluding Single Objects)
Level of Abstraction	Object Sorting Test (OST)	Preferred Level of Abstraction	Mean Level of Abstraction Percentage of Conceptual Definitions Percentage of Functional Definitions

TABLE II (continued)

	THE MEASURING INSTRUMENTS		
Area	Title	Classification	Scores Derived
Level of Abstraction (continued)	Object Sorting Test (OST)	Preferred Level of Abstraction	Percentage of Conceptual and Functional Definitions
Intelligence	Wechsler Intelligence Scale for Children (WISC)	IQ	Full Scale IQ Performance IQ Verbal IQ
			Information Comprehension Arithmetic Similarities Vocabulary
			Picture Completion Picture Arrangement Block Design Object Assembly Coding
Cognition	Brick Uses Test	Spontaneous Flexibility	Categories of Usage Score

3.	Narrative Test	Group
4.	Brick Uses Test	Group
5.	Object Sorting Test	Individual
6.	Word Association Test	Individual
7.	Proverbs Test	Individual
8.	Witkin's Embedded Figures Test	Individual
9.	Wechsler Intelligence Scale for Children	Individual

The Null Hypotheses Tested

The data were used in statistical analyses designed to test the following null hypotheses:

Null Hypothesis 1. Measures of language differentiation are not significantly related, i.e., unity of verbal habit will not be demonstrated.

Null Hypothesis 2: Performance on measures of reading comprehension is not significantly related to performance on measures of language differentiation.

Null Hypothesis 3: Performance on measures of field dependence-independence is not significantly related to performance on a measure of conceptual differentiation.

Null Hypothesis 4: Performance on measures of language differentiation is not significantly related to performance on measures of

cognitive style.

Null Hypothesis 5: Performance on measures of reading comprehension is not significantly related to performance on measures of cognitive style.

III. ANALYSIS OF THE DATA

The analysis of the reading, language, and object-sorting protocols was carried out by the investigator. The analysis of the intelligence test protocols and assessment of performance on the Embedded Figures Test were completed by the school psychologist who assisted the investigator in the testing program. All standardized instruments were scored according to instructions given in the test manuals. All other instruments were scored according to classification schemes derived from the literature or prepared for the study.

Each student was assigned an identification number. ID number, sex code number, age, and test scores were punched on IBM cards in preparation for data processing.

The data were analyzed using statistical procedures programmed by the Division of Educational Research Services, University of Alberta, for use on an IBM 360/67 computer.

The null hypotheses were tested through the following procedures:

1. Means and standard deviations of all scores were compared by means of "t" tests for boys versus girls.

2. Correlation techniques were employed to determine extent and the significance of the relationships among the variables. The pattern of intercorrelations was determined for separate tests, for the block of language data, and across all tests.

3. Factor analysis was carried out as an exploratory analysis of overall patterning.

4. Stepwise multiple regression analyses were used in order to determine the language variables which best predicted performance on the reading comprehension tests.

Computer Programs

The following computer programs (Division of Educational Research Services, University of Alberta, 1969) were used in processing the data:

1. Title: DERS ANOVA10 T-Tests with tests on Variances and Welch Approximations.

The "t" values (and their probability levels) between two samples were calculated using the formula for "t" tests between independent samples, with or without missing data. F ratios (and their probability levels) for the differences between sample variances were given.

2. Title: DERS FACTO3 Factor Analysis Using Hotelling's Method.

The program calculated Pearson-Product-Moment calculations and then proceeded to find the eigenvectors in the order of their eigenvalues from largest to smallest. Following determination of the unrotated factor matrix the program carried out a Varimax rotation.

3. Title: DERS MULRO6 Stepwise Regression.

A stepwise regression was calculated using the method of determinants as described in Draper and Smith (1966) .

IV. PILOT STUDY

Prior to the initiation of the main study a pilot study was conducted with selected samples of grade six students for the following purposes: (1) to determine the optimum time limits for the administration of tests, (2) to allow for trial administration of the Embedded Figures Test with eleven-year-old subjects; (3) to determine ease of identification of the line drawings which were to be used in the Object Sorting Test; (4) to determine the range of performance possible on the Intermediate form of the Van Wagenen Analytical Reading Scale, Form M, and in particular to determine the upper limits on the test, (5) to allow for trial testing in the preparation of experimental reading materials, (6) to determine the reliability and validity of

specific tests, (7) to note any revisions in the construction, administration, or scoring of particular instruments to be used in the exploratory study. Outcomes of the pilot study are discussed in the relevant sections on the measuring instruments. The data gathered during the pilot project are presented in Appendix D.

V. SUMMARY

This present chapter has presented an outline of the procedures, the selection of the subjects, the selection and construction of tests, and the methods used to analyze the data. A description of the statistical treatment of the data is presented. An outline of the pilot study concluded the chapter.

CHAPTER V

THE RESULTS OF THE INVESTIGATION

The purpose of the study was to explore the relations among language, reading, and cognitive style. The present chapter is concerned with the findings of the exploratory study. The presentation and analysis of the data are organized in five major sections. Section One is concerned with a description of the sample and with the results of a comparison of means for boys and girls on the major scores. Section Two presents the findings of the correlational analysis as it reveals the relationships of the language, reading and cognitive style variables for the total sample. Section Three examines language and IQ variables as predictors of reading achievement. This section is concerned with the results of the Stepwise Regression Analyses which were used to range in order of priority the tests of language differentiation and IQ as predictors of reading. Factor analysis was employed to determine the nature of the underlying structure. Findings of the factor analysis are presented in Section Four. A summary of the findings is presented in Section Five.

Language differentiation was defined in terms of the quality of language function as manifested in vocabulary, proverb, and word association responses. A hierarchical system of concepts was assumed and protocols

were analyzed basically in terms of an abstract-concrete dimension. Degrees of abstractness and concreteness were assumed to be indicators of greater or less language differentiation. Results were examined to determine whether qualitative categories were related across the language measures, i.e., Is there unity of language habit as demonstrated by unity in concrete variables across measures? The relation of reading to language was explored within the context of language differentiation, i.e., How do abstract and concrete variables in language function relate to reading comprehension? The relation of cognitive styles to each other and the relation of cognitive styles to reading were assessed. The relation of cognitive styles to language differentiation was determined through an exploration of the relation of cognitive styles to the abstract and concrete variables.

To provide answers to the major questions of the study five null hypotheses were tested. In the following sections the findings and interpretations are set forth according to the areas under investigation.

The 0.01 level of significance was used as the criterion for the correlation analysis. Test statistics with a probability of occurrence of .05 or fewer are indicated. Group means and standard deviations for all variables are presented in Table LXV, Appendix E.

I. THE SAMPLE

The subjects for the study were seventy-two grade-six students whose average age was eleven years, nine months. A description of the sample characteristics is presented in the following section.

Analysis of Sex Differences

Prior to hypothesis testing the means of the scores for boys versus girls were compared by means of "t" tests. Sex comparisons were obtained for the measures of language, reading, cognitive style, intelligence, and spontaneous flexibility. The results of the analysis are presented in Appendix F. As indicated by the results, no significant differences were obtained for reading, conceptual differentiation, proverbs, or spontaneous flexibility. A comparison of means for the Wechsler Intelligence Scale for Children indicated a difference in favor of boys on the WISC Verbal IQ ($t = 2.205$, $p < .05$) which could be attributed primarily to superiority in Vocabulary ($t = 2.464$, $p < .05$) . A comparison of the qualitative levels of vocabulary response indicated that boys gave significantly more synonym V40 definitions ($t = 2.300$, $p < .05$). Girls had significantly higher Error V40 scores than boys ($t = 2.847$, $p < .01$) and their Error V40 category contained significantly more omissions ($t = 2.488$, $p < .05$) . On the Word Association Test, girls gave more form class responses ($t = 2.710$,

$p < .01$) while boys gave more syntagmatic responses ($t = 2.858$, $p < .01$). Boys tended to be more field independent than girls ($t = 2.056$, $p < .05$).

Consideration of the number of significant mean differences and a recognition that 5 percent of these could occur by chance, the exploratory nature of the study, and the size of the sample indicated the feasibility of performing data analysis for the combined sample. Means and standard deviations are presented for the sexes separately only in the discussions of the major scores.

Intelligence. Intellectual performance was measured through the administration of the Wechsler Intelligence Scale for Children. Descriptive statistics for the Wechsler intelligence Scale are presented in Table III. For all subjects the mean WISC Full Scale score was 117.53, with a range from 92 to 140. The average subject performs at the bright normal intellectual level.

Boys and girls did not differ significantly in performance on the WISC Full Scale. A significant difference at the .05 level was found for boys on the WISC Verbal Scale. Garai and Scheinfeld (1968) report that on the WISC, males obtained "somewhat higher Full IQ's and Verbal IQ's than females, who have higher Performance IQ's than males as a group" (p. 251). Reported sex differences in language generally favor girls. However, the superiority seems to be an early verbal superiority and boys tend to

TABLE III

DESCRIPTIVE STATISTICS FOR THE TOTAL SAMPLE AND FOR BOYS AND GIRLS ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

	Total Sample (N=72)			Boys (N=38)			Girls (N=34)		
	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
WISC									
Full Scale	117.53	11.72	92-140	118.97	12.41	92-140	115.91	10.48	96-136
Verbal	116.88	12.18	89-149	119.79	11.23	101-149	113.62	12.18	89-145
Performance	114.94	12.34	80-138	114.13	13.79	80-138	115.85	10.18	90-136

catch up by school age (e.g., Moore, 1967) . There are also suggestions in the literature that the reported verbal superiority of females is based, not on a broad vocabulary or superior verbal comprehension but rather on language tasks which depend on rules (Weinberg and Rabinowitz, 1970, p. 222) . Tyler (1965) cites evidence to show that it is in verbal fluency (Thurstone's W) rather than in knowledge of verbal meanings (V) that females tend to excel (p. 244) . The intercorrelations for the Wechsler Intelligence Scale subtest scores, and correlations of the subtest scores with IQ are presented in Table IV. The results show that the Vocabulary portion of the test has the second highest correlation with Verbal IQ.

Reading. Table V contains the means, standard deviation and ranges for the eight reading variables. Numerous studies support the observation that boys have more difficulty with reading than do girls. In the present study, a trend toward slightly higher scores on all reading variables was indicated in the reading scores for boys. However, no significant differences were found between boys and girls in reading achievement in the preliminary analysis of the data.

II. CORRELATIONAL ANALYSIS: LANGUAGE, READING AND COGNITIVE STYLE

This section presents the findings of the correlational analysis. The

TABLE IV

INTERCORRELATIONS AMONG CHILDREN'S SCORES FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

	WISC	1	2	3	4	5	6	7	8	9	10	11	12	13
1.	WISC Full Scale IQ	1.000												
2.	WISC Verbal IQ	.864**	1.000											
3.	WISC Performance IQ	.836**	.458**	1.000										
4.	Information	.663**	.767**	.346**	1.000									
5.	Comprehension	.761**	.813**	.469**	.469**	1.000								
6.	Arithmetic	.472**	.542**	.209	.368**	.337**	1.000							
7.	Similarities	.661**	.766**	.342**	.476**	.543**	.361**	1.000						
8.	Vocabulary	.745**	.831**	.411**	.574**	.643**	.334**	.595**	1.000					
9.	Picture Completion	.584**	.391**	.604**	.296*	.426**	.043	.259*	.428**	1.000				
10.	Picture Arrangement	.517**	.300*	.590**	.200	.223	.175	.159	.361**	.283*	1.000			
11.	Block Design	.573**	.340**	.660**	.339**	.334**	.202	.279*	.179	.285*	.186	1.000		
12.	Object Assembly	.598**	.273*	.781**	.205	.312**	.068	.205	.246*	.332**	.284*	.557**	1.000	
13.	Coding	.250*	.062	.398**	-.036	.047	.098	.151	-.022	.004	.122	.009	.193	1.000

*p < .05
**p < .01

TABLE V

DESCRIPTIVE STATISTICS FOR THE TOTAL SAMPLE AND FOR BOYS AND GIRLS ON ALL THE READING VARIABLES

Variables	Total Sample (N=72)			Boys (N=38)			Girls (N=34)		
	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
VW Total	83.24	8.21	65-94	84.29	7.31	65-94	82-06	8.86	66-94
VW Central Thought	16.06	2.44	10-20	16.34	2.26	10-20	15.74	2.55	10-20
VW Simple Details	17.49	2.16	11-20	17.79	1.91	13-20	17.15	2.33	11-20
VW Related Ideas	17.08	2.17	12-20	17.37	1.93	13-20	16.76	2.35	12-20
VW Inferences	16.60	2.09	12-20	16.76	2.22	10-20	16.41	1.90	12-20
VW Interpretation	16.01	1.84	11-20	16.03	1.60	12-19	16.00	2.06	12-20
Narrative	16.71	5.14	7-27	17.37	4.46	10-27	15.97	5.65	3-27
VW + Narrative	99.94	11.88	79-121	101.66	9.80	79-115	98.03	13.43	80-121

presentation and analysis of the data are organized according to the three major areas studied, i.e., language, reading and cognitive style.

Language

Language development was assessed through an analysis of the qualitative nature of the responses to three measures, a Vocabulary Test, a Word Association Test, and a Proverbs Test. Greater language differentiation was defined in terms of synonym responses on the Vocabulary measure, by paradigmatic responses and/or class associates on the Word Association Test, and by responses on the Proverbs measure that were general, metaphorical, and indicative of a set for definition.

Immaturity in language was defined by a tendency to give function and description responses on a measure of vocabulary, by syntagmatic responses on a Word Association Test, by perception of proverbs as statements of fact, and by difficulty in establishing an analogical relationship between literal and figurative meaning.

The results for the language measures are presented in the sections which follow.

Vocabulary.

All the definitions given by each subject to the Vocabulary subtest of the Wechsler Intelligence Scale for Children were scored for one of five qualitative levels: Synonym, Function, Description, Function

and Description, and Error. Qualitative vocabulary scores were thus obtained for each category on the basis of performance on the forty words of the subtest. As total scores could result from responses to different stimulus words, scores were also determined for the first ten items of the Vocabulary Test for which a basically complete set of protocols was obtained.

Linguistic operations at the description level were defined by responses of the following types: pillow--"something soft"; bicycle--"it's got wheels." More frequently, descriptions were modified by a statement of use, e.g., letter-"paper that you send, and you put what you want to say to another person." Linguistic operations at the functional level were characterized by action-bound responses, e.g., hat--"something to keep the sun from hitting your head, to protect your head from the sun"; nail--"a thing you pound in with a hammer," donkey--"well, they were use for in--not much now, giving kids rides." Linguistic activity at a higher level was defined by definitions of the synonym type, e.g., donkey--"a stubborn animal"; nuisance--"a bother, a troublemaker"; microscope--"an instrument for looking at the small molecules."

For the overall test, the mean number of responses for the Synonym, Function, and Description categories was 13.17, 5.92, and 3.49 respectively. Synonym responses constituted the largest component of the total responses. This finding was expected as it has been indicated by Feifel and Lorge (1950),

Burns (1960), and Russell and Saadeh (1962) that the commonest form of definition among children aged nine or over is definition by synonym. An inspection of the means for the first ten words indicated a mean number of Synonym responses of 4.49 and a mean number of Function responses of 3.31. The high proportion of Function responses for the first ten words may be attributed to the presence of words such as "umbrella" which elicited the highest number of functional responses. The second highest number of Functional responses was elicited by the word "hat." On the other hand, the more complex stimulus material of the total test may have provoked an increase in abstract performance on the total test. Lundsteen and Michael (1966) found that more difficult material stimulated more complex operations in a sample of grade three children.

The matrix of intercorrelation coefficients for the vocabulary measures is presented in Table VI. Intercorrelation patterns for the total list (V40 items) are similar to those for the first ten vocabulary items (V10 items) of the test. The significant and high negative correlation between the Synonym and Function scores suggests that these categories represent different aspects of language performance. Correlation coefficients for the Description and Synonym categories were close to zero indicating a random relationship. A significant ($p < .05$ level) negative correlation between Function and Description categories suggests contrasting categories of response.

TABLE VI

INTERCORRELATIONS AMONG QUALITATIVE VOCABULARY SCORES

Vocabulary	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Synonym V10	1.000															
2. Function V10	-.721**	1.000														
3. Description V10	-.184	-.268*	1.000													
4. Function and Description V10	-.090	-.513**	.088	1.000												
5. Total Function and Description V10	-.994**	.713**	.190	.110	1.000											
6. Error V10	-.169	.165	-.032	-.175	.062	1.000										
7. Synonym V40	.843**	-.678**	-.085	.012	-.830**	-.223	1.000									
8. Function V40	-.617**	.876**	-.324**	-.405**	.614**	.095	-.669**	1.000								
9. Description V40	.004	-.254*	.586**	.061	.004	-.066	.071	-.376**	1.000							
10. Function and Description V40	-.135	-.425**	.080	.895**	.140	-.036	-.099	-.348**	.006	1.000						
11. Total Function and Description V40	-.770**	.616**	.025	.053	.774**	.050	-.772**	.725**	.172	.141	1.000					
12. Error V40	-.553**	.446**	.104	-.065	.528**	.294*	-.792**	.329**	-.276*	.020	.225	1.000				
13. Omission V40	-.502**	.375**	.137	-.023	.488**	.190	-.737**	.300*	-.153	.020	.266*	.876**	1.000			
14. Wrong Definition V40	.177	-.100	.019	-.121	-.191	.109	.246*	-.162	-.045	-.058	-.240*	-.145	-.548**	1.000		
15. Clang Association V40	-.199	.304**	-.153	-.133	.201	.006	-.148	.220	-.168	-.101	.089	.134	-.036	-.019	1.000	
16. Misinterpretation V40	.090	-.126	-.231	-.239*	-.090	-.010	.137	-.008	-.147	.200	.003	-.217	-.396**	.110	.047	1.000

*p < .05
**p < .01

The correlation coefficient of .586 for Description V10 and Description V40 is lower than that obtained for Synonym V10 and Synonym V40, or for Function V10 and Function V40. The first ten test items consist of one form class, nouns, while the forty word list is composed of nouns, verbs and adjectives. The somewhat lower correlation coefficient for the Description ratings may reflect difficulties inherent in scoring the total list in terms of the Description category.

An analysis of the patterns of correlations for V40 and V10 scores with scores for the total test battery indicated generally parallel findings for both lists. Discussion of Vocabulary scores is therefore in terms of the total Vocabulary test except where significantly different patterns of correlation were found.

The correlation coefficients for the qualitative vocabulary scores and the WISC are presented in Table VII. As can be seen from Table VII the correlation between the Synonym V40 scores and the WISC Verbal IQ is high. The association may be interpreted in terms of the influence of verbal intelligence upon the production of abstract definitions. Correlations between the Synonym V40 score and the quantitative score of the WISC Vocabulary were substantial. Approximately 59 percent of the variance of the one variable is predictable from the other. A comparison of the data presented in Table IV and Table VII indicates that correlation coefficients

TABLE VII

CORRELATIONS BETWEEN QUALITATIVE VOCABULARY SCORES AND SCORES FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Item	WISC												
	Full Scale IQ	Verbal IQ	Perf. IQ	Inf.	Comp.	Arith.	Similar.	Voc.	P.C.	P.A.	B.D.	O.A.	Cod.
Synonym V10	.296*	.402**	.072	.263	.272*	.049	.392**	.597**	.140	.120	-.138	-.016	.060
Function V10	-.261*	-.403**	-.034	-.213	-.336*	-.058	-.368**	-.500**	-.038	-.068	.115	.006	-.007
Description V10	-.118	-.025	-.147	-.149	-.009	.140	.003	-.107	-.175	-.098	-.042	-.066	-.218
Function and Description	.115	.149	.061	.073	.209	-.070	.094	.092	-.017	.020	.034	.061	.077
Total Function - Description V10	-.283*	-.386**	-.065	-.268*	-.259*	-.054	-.369**	-.575**	-.135	-.110	.140	.019	-.054
Error V10	-.157	-.188	-.073	.014	-.155	.034	-.254*	-.272*	-.060	-.104	.001	-.028	-.063
Synonym V40	.573**	.671**	.279*	.462**	.526**	.251*	.563**	.784**	.232*	.229	.109	.136	.043
Function V40	-.250*	-.376**	-.043	-.254*	-.291*	-.089	-.376**	-.400**	.053	-.047	.038	-.011	-.028
Description V40	.041	.128	-.061	.084	.077	.082	.030	.204	.075	.057	-.081	-.092	-.293*
Function and Description V40	.066	.130	-.003	.091	.144	-.021	.026	.033	-.073	.067	-.016	-.003	.072
Total Function and Description V40	-.227	-.288**	-.087	-.200	-.211	-.060	-.403**	-.319**	.061	.017	-.023	-.069	-.155
Error V40	-.661**	-.754**	-.342**	-.525**	-.604**	-.323**	-.482**	-.896**	-.417**	-.364**	-.153	-.142	.096
Omissions V40	-.610**	-.681**	-.329**	-.476**	-.604**	-.274*	-.430**	-.787**	-.399**	-.304**	-.153	-.119	.064
Wrong Definition V40	.132	.121	.093	.012	.212	.122	.092	.100	.106	.034	-.014	-.020	.096
Clang Association V40	-.006	-.038	.036	.158	-.160	-.059	.029	-.069	-.090	.032	.126	.014	.019
Misinterpretation V40	.170	.203	.073	.187	.329**	-.149	.016	.235*	.207	-.028	.110	.069	-.174

*p < .05
**p < .01

for Synonym V40 and WISC subtest scores are generally lower than the correlation coefficients for WISC Vocabulary and WISC subtest scores. The results for Function V40, as presented in Table VII show significant negative correlations with WISC Similarities and WISC Vocabulary. The WISC Similarities subtest may be interpreted as a measure of the capacity to abstract (e.g., Gardner and Schoen, 1962) . Wolman and Barker (1965) found that as the number of words that the child knows increases, the percent of use definitions decreases. For the present sample a significant negative correlation was obtained between Function V40 and the quantitative score on the WISC Vocabulary subtest.

Table VIII presents the correlations among the qualitative measures of Vocabulary and Spontaneous Flexibility. Spontaneous Flexibility is a divergent-thinking factor which is semantic in content and involves spontaneous shifts of classes. As is indicated by Table VIII, correlations among qualitative measures of vocabulary and Spontaneous Flexibility are close to zero. For the present sample, no association was obtained between qualitative level of verbal responses and the ability to shift classes.

Word association. The changes with age that occur in children's word association have been well documented in the literature (e.g., Ervin, 1961; Entwisle, 1966). This change is characterized by a striking rise in

paradigmatic associates (associates matching the form class of the stimulus) and a concomitant decline in syntagmatic associates (associates which occupy different grammatical positions from the stimulus). Entwisle (1966b) has stated that, "One principle or the other, paradigmatic or sequential, is governing the production of most responses by the fifth grade" (p. 62). The method of discrete free-association was used in the present study. Scoring procedures which characterized the qualitative nature of the responses were employed. These included categorization of responses according to a paradigmatic-syntagmatic dichotomy, categorization of responses according to grammatical form class, and categorization of noun-noun coordinate, adjective-antonym, whole-part, and noun supraordinate noun patterns. In the present study the paradigmatic category was defined by responses such as draw-sketch, pretty-beautiful. The syntagmatic category was characterized by the following types of responses: flower-pot, draw-picture. Responses for the noun-coordinate noun category included associates such as moon-sun, eye-ear. Adjective-antonym responses included pairs such as sweet-sour, big-small. The whole-part category was defined by responses such as tree-branch, flower-petal. Supraordinate responses included such associates as apple-fruit, mother-human.

Table IX presents the correlation coefficients among the Word Association ratings for the total sample. The production of Syntagmatic associations

TABLE VIII

CORRELATIONS BETWEEN QUALITATIVE VOCABULARY SCORES AND SPONTANEOUS FLEXIBILITY SCORES

Vocabulary	Spontaneous Flexibility
Synonym V10	.087
Function V10	-.050
Description V10	-.004
Function and Description V10	-.032
Total Function and Description V10	-.082
Error V10	-.054
Synonym V40	.122
Function V40	.027
Description V40	-.052
Function and Description V40	.012
Total Function and Description V40	.001
Error V40	-.191
Omission V40	-.224
Wrong Definition V40	.139
Clang Association V40	.020
Misinterpretation V40	.062

TABLE IX

INTERCORRELATIONS AMONG WORD ASSOCIATION SCORES

Word Association	1	2	3	4	5	6	7	8	9	10
1. Noun-Noun	1.000									
2. Adjective-Adjective	.462**	1.000								
3. Verb-Verb	.431**	.638**	1.000							
4. Total Form Class	.839**	.820**	.800**	1.000						
5. Syntagmatic	-.685**	-.696**	-.694**	-.839**	1.000					
6. Paradigmatic	.700**	.672**	.636**	.819**	-.963**	1.000				
7. Noun-Coord. Noun	.350**	.373**	.495**	.481**	-.391**	.409	1.000			
8. Adjective-Antonym	.448**	.692**	.483**	.640**	-.549**	.586**	.296*	1.000		
9. Noun-Supra-ordinate	-.075	-.185	-.037	-.116	-.028	.032	.055	-.477**	1.000	
10. Whole-Part	.142	.024	-.076	.059	-.060	.068	-.130	.060	-.087	1.000

*p < .05
**p < .01

is negatively correlated with the production of responses in the same form class as the stimulus word and with production of responses which form semantic linkages with the stimulus word. The semantic responses, Noun-Supraordinate and Whole-Part showed only a random relation to the form class responses and to Noun-Coordinate and Adjective-Antonym responses. Scores for the semantic categories Noun-Coordinate Noun and Adjective-Antonym showed low but significant correlations with the grammatical categories.

It has been found that a major shift from syntagmatic to paradigmatic responses occurs in children's association between ages six to eight. Entwisle (1966b) has stressed that the shift may depend upon the form class of the stimulus word. Moreover IQ differences are marked at the period of most rapid change.

Correlations among the Word Association Test variables and the WISC for the present study are presented in Table X. As indicated by Table X, product moment correlation coefficients between Word Association Test scores and WISC scores, with the exception of Picture Assembly, are consistently close to zero. Inasmuch as Picture Assembly is a non-verbal subtest, its relation to Adjective-Antonym is not clear. Cramer (1968) suggests that the problems of the relation between word association and intelligence is a complex one. Entwisle (1966) stresses that "To see correlates of

TABLE X

CORRELATIONS BETWEEN WORD ASSOCIATION SCORES AND SCORES FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Item	ASSOCIATIVE RESPONSES							
	Noun-Noun	Adjective-Adjective	Verb-Verb	Total Form	Syntagmatic	Paradigmatic	Noun-Coord.	Adjective-Anionym
WISC Full Scale	.073	.042	.035	.065	.008	.009	.020	.155
WISC Verbal	.069	-.090	-.094	-.025	.064	-.017	-.042	.088
WISC Performance	.066	.173	.173	.153	-.076	.054	.085	.185
Information	-.019	-.041	.023	.016	-.031	.069	-.041	.125
Comprehension	.153	-.075	-.080	.030	.062	-.004	-.022	-.014
Arithmetic	.146	-.048	-.131	.018	.111	-.088	-.048	.108
Similarities	.003	-.047	.016	-.010	.038	-.014	.041	-.007
Vocabulary	-.012	-.028	-.093	-.047	-.013	.011	-.078	.164
Picture Completion	-.014	.069	.170	.073	-.079	.087	.080	.204
Picture Assembly	.018	.160	-.099	.032	.036	-.042	-.072	.319**
Block Design	.056	.093	.205	.130	-.047	.043	.157	-.018
Object Assembly	-.053	.055	.076	.016	.005	-.039	.089	.008
Coding	.121	.039	.055	.097	.052	-.070	.093	-.017

** $p < .01$

intelligence in linguistic development, one must analyze data over a suitable age range. Children sampled before or after a change takes place may contribute only 'noise' to the data" (p. 79).

Sex comparisons for the Word Association Test are presented in Table XLVII, Appendix F. Results for the present study indicated that girls produced significantly more Adjective-Adjective responses (.01 level) verb-verb responses (.01 level), and Total Form Class responses (.01). Boys produced significantly more (.01 level) syntagmatic responses. Entwisle (1966) has reported that females are more accelerated than males in giving both adjectival and verb responses. Palermo (1963) found that females give more opposite responses than males over the Grades one through twelve. Inasmuch as paradigmatic responses are associated with greater language maturity the girls in this study are more advanced than the boys in this aspect of language development.

The correlation between Word Association and Spontaneous Flexibility is presented in Table XI. Table XI indicates a significant correlation (.01 level) between Spontaneous Flexibility and Coordinate Noun responses. This correlation may be interpreted in terms of an association between flexibility in shifting classes and the production of associates that are synonyms of the stimulus word or members of the same class as the stimulus word.

Proverbs. Mature and immature language behavior was explored

TABLE XI

CORRELATION BETWEEN WORD ASSOCIATION SCORES AND SPONTANEOUS FLEXIBILITY SCORES

Item	Spontaneous Flexibility
WAT Noun-Noun	-.077
WAT Adjective-Adjective	-.105
WAT Verb-Verb	.011
WAT Total Form Class	-.074
WAT Syntagmatic	-.002
WAT Paradigmatic	.009
WAT Noun-Coordinate	.309**
WAT Adjective-Antonym	.064
WAT Noun-Supraordinate	.053
Whole-Part	-.022

**p < .01

through an examination of the qualitative features of Proverb Test protocols. An abstract approach was defined in terms of symbolic meaning and a concrete approach in terms of literal meaning. Subjects were asked to give the meanings of seven proverbs. Protocols were rated for accuracy and for qualitative level of response. Variations in the response protocols are represented by the following samples: Cloud: Everything has some kind of profit; everything has some part of good (Definition) . Smoke: It states a fact, really--it's true--where there's smoke there's fire (Other) . Milk: Don't stand looking at it. Mop it up (Literal) . Milk: What's done is done (Metaphorical) .

The intercorrelations among the Proverb Ratings are presented in Table XII. A pattern of significant negative relationships is evident between the categories designated abstract and the categories designated concrete. Gorham (1956) has postulated that the negative relationship between the abstract and concrete scores of the Proverbs Test suggests that the abstracting function and concreteness of thinking may actually be opposite portions of an abstract-concrete continuum. A comparison of sex differences for the Proverbs test yielded no significant differences for any of the categories tested.

The correlations between the Proverb measures and the WISC are presented in Table XIII. As Table XIII indicates, positive correlations

TABLE XII

INTERCORRELATIONS AMONG PROVERB CATEGORIES

Proverbs	1	2	3	4	5	6	7	8	9	10
1. Total	1.000									
2. Omit	-.244*	1.000								
3. Definition	.664**	-.157	1.000							
4. Other	-.568**	-.211	-.932**	1.000						
5. General	.545**	-.462**	.696**	-.519**	1.000					
6. Concrete	-.473**	-.099	-.688**	.717**	-.831**	1.000				
7. Meta-phorical	.771**	-.148	.773**	-.711**	.545**	-.529**	1.000			
8. Mixed	-.126	-.075	.221	-.192	.132	-.103	-.303**	1.000		
9. Literal	-.594**	-.112	-.852**	.884**	-.476**	.614**	-.731**	-.349**	1.000	
10. Rating	.749**	.005	.854**	-.847**	.550**	-.632**	.848**	.120	-.918**	1.000

* $p > .05$

** $p > .01$

TABLE XIII

CORRELATIONS BETWEEN PROVERB SCORES AND SCORES FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

	WISC												
	Full Scale I.Q.	Verbal I.Q.	Perf. I.Q.	Inf.	Comp.	Arith.	Similar.	Vocab.	P. C.	P. A.	B. D.	O. A.	Coding
Proverb Correct	.361**	.452**	.149	.333**	.388**	.138	.335**	.527**	.133	.168	.093	.076	-.123
Proverb Omit	-.045	-.144	.053	.008	-.177	.030	-.168	-.086	.111	-.043	.108	.047	-.109
Proverb Definition	.302*	.435**	.084	.351**	.268	.124	.348**	.509**	.111	.089	.053	.013	-.111
Proverb Other	-.283*	-.378**	-.103	-.351**	-.200	-.134	-.283*	-.473**	-.150	-.073	-.092	-.030	.149
Proverb General	.159	.297*	-.024	.246*	.162	.039	.263*	.290*	-.013	.083	-.011	-.151	.039
Proverb Concrete	-.152	-.247*	-.006	-.284*	-.076	-.064	-.186	-.277*	-.059	-.076	-.060	.149	.035
Proverb Metaphorical	.246*	.345**	.086	.281*	.266*	.118	.184	.416**	.129	.095	.079	.000	-.195
Proverb Mixed	.132	.165	.062	.119	.045	.062	.257*	.121	.036	.080	-.001	.027	.132
Proverb Literal	-.303**	-.393**	-.127	-.353**	-.236*	-.172	-.285*	-.459**	-.169	-.132	-.089	-.026	.141
Proverb Rating	.302*	.423**	.093	.395**	.268*	.195	.259*	.484**	.126	.092	.117	.013	-.198

*p < .05
**p < .01

TABLE XIV

CORRELATIONS BETWEEN PROVERB SCORES AND SPONTANEOUS FLEXIBILITY SCORES

Item	Spontaneous Flexibility
Proverb Correct	.003
Proverb Omit	-.083
Proverb Definition	-.063
Proverb Other	.092
Proverb General	.033
Proverb Concrete	.004
Proverb Metaphorical	-.006
Proverb Mixed	-.009
Proverb Literal	.046
Proverb Rating	-.021

were obtained for the abstract categories Proverb Definition, Proverb General, Proverb Metaphorical, and Proverb Rating with Intelligence. The scores for Proverb Other, Proverb Concrete, and Proverb Literal tended to yield negative correlations. Correlation coefficients for the Proverb and WISC scores were low to moderate. It would appear that the Proverb Test is not merely duplicating the functions of the Intelligence test.

Table XIV presents the correlations among Proverb scores and a measure of Spontaneous Flexibility. As can be seen from Table XIV, the correlations among Proverb scores and Spontaneous flexibility are close to zero, indicating that the divergent production of semantic classes is unrelated to abstraction when it is defined as symbolic meaning on a Proverbs test.

Product-moment correlations between Vocabulary and Word Association scores are presented in Table XV. As is indicated by Table XV, the matrix failed to yield any significant correlations. Trends for qualitative levels of vocabulary and paradigmatic responses were consistent, e.g., correlations between Synonym responses and Paradigmatic responses were positive, while correlations between Function and Paradigmatic responses and Description and Paradigmatic responses were negative.

Masters (1969) found that syntagmatic associations and functional definitions declined from age four to nine. He also found a low but significant relationship between them (.27). Shepard (1970), however, found

TABLE XV

CORRELATIONS BETWEEN QUALITATIVE VOCABULARY SCORES AND WORD ASSOCIATION SCORES

Item	WAT Noun-Noun	WAT-Adjective Adjective	WAT Verb-Verb	WAT Total Class Form	WAT Syntagmatic	WAT Paradigmatic	WAT Noun-Coordinate	WAT Adjective-Antonym	WAT Noun-	WAT Whole-Part
Synonym V10	.014	.088	.004	-.022	-.012	.073	.029	-.085	.215	.102
Function V10	-.041	.109	.065	.037	.054	-.044	.054	.044	-.126	-.127
Description V10	-.116	-.110	-.100	-.134	.144	-.155	-.158	-.035	-.013	-.023
Function and Description V10	.092	-.006	-.089	.018	-.001	.035	-.062	.044	-.078	.102
Total Function-Description V10	-.038	.075	-.028	-.004	.127	-.097	-.048	.066	-.208	-.092
Error V10	.223	.122	.224	.237	-.217	.217	.176	.188	-.093	-.108
Synonym V40	.102	-.022	-.019	.041	-.116	.107	-.037	.035	.068	.150
Function V40	-.095	.033	.013	-.035	.088	-.093	-.093	.125	-.019	-.108

TABLE XV
(continued)

Item	WAT Noun-Noun	WAT Adjective-Adjective	WAT Verb-Verb	WAT Total Class Form	WAT Syntagmatic	WAT Paradigmatic	WAT Noun-Coordinate	WAT Adjective-Antonym	WAT Noun-	WAT Whole-Part
Function and Description V40	.147	.002	-.110	.043	.004	.044	.062	.101	-.099	.080
Total Function-Description V40	-.140	.031	-.064	-.086	.171	-.142	-.001	.114	-.224	-.145
Error V40	-.014	.002	.084	.022	.014	-.028	.063	-.163	.114	-.087
Omissions V40	-.054	-.027	.056	-.020	.016	-.042	.077	-.197	.107	-.121
Wrong Definition V40	.106	.076	.010	.087	-.006	.027	-.053	.136	-.019	.068
Clang Association V40	-.048	.011	.058	-.002	-.028	.041	-.032	.059	.009	.166
Misinterpretation V40	-.037	-.030	-.007	.007	.013	.011	-.002	.009	-.053	-.003

no correlations between syntagmatic associations and function definitions and concluded, "The tasks (associating and defining) constituted very different stimulus situations and apparently elicited alternative unrelated associative hierarchies" (p. 412). The results for the present study are similar to those obtained by Shepard.

The correlations between Vocabulary and Proverb scores are presented in Table XVI. Table XVI indicates a moderate correlation between qualitative levels of Vocabulary responses and Proverb responses. Abstract categories on the Proverbs test tend to be associated with abstract categories on the Vocabulary test, e.g., Proverb General and Proverb Metaphorical correlate .499 and .469 respectively with Synonym V40 ($p < .01$). The patterns for the concrete categories are also consistent. The correlation coefficient for Proverb Concrete and Function V10 is .429, ($p < .01$). The results suggest some correspondence in the nature of the abstract domains and concrete domains which are being assessed by the different tests.

Table XVII presents the product-moment correlations between the Proverb Tests and the Word Association Tests.

Six correlation coefficients were significant at the .05 level. Proverb Concrete was negatively related to Verb-Verb and to Total Form Class. Proverb Metaphorical was negatively related to Syntagmatic associates. Proverb Other was negatively related to Paradigmatic responses. The

TABLE XVI

CORRELATIONS BETWEEN QUALITATIVE VOCABULARY SCORES AND PROVERB SCORES

Item	PROVERB RESPONSES									
	Correct	Omit	Definition	Other	General	Concrete	Metaphorical	Mixed	Literal	Rating
Synonym V10	.494**	-.237*	.467**	.375**	.408**	-.323**	.420**	.056	-.379**	.408**
Function V10	-.354*	.311**	-.485**	.366**	-.450**	.309**	-.385**	-.209	.427**	-.438**
Description V10	-.130	-.136	.053	-.002	.101	-.105	.068	.001	-.013	.022
Function and Description V10	-.022	-.153	.144	-.086	.149	-.059	.019	.299*	-.183	.153
Total Function-Description V10	-.491**	.203	-.452**	.373**	-.385**	.318**	-.411**	-.044	.375**	-.404**
Error V10	.090	.340**	-.194	.067	-.263*	.084	-.128	-.112	.085	-.090
Synonym V40	.593**	-.174	.547**	-.477**	.469**	-.420**	.499**	.052	-.470**	.528**
Function V40	-.403**	.203	-.485**	.406**	-.501**	.429**	-.421**	-.082	.413**	-.464**
Description V40	.158	-.095	.188	-.151	.218	-.191	.218	-.091	-.181	.199

TABLE XVI
(continued)

Item	PROVERB RESPONSES									
	Correct	Omit	Definition	Other	General	Concrete	Metaphorical	Mixed	Literal	Rating
Function and Description V40	-.062	-.145	.097	-.043	.120	-.027	-.007	.204	-.096	.096
Total Function-Description V40	-.403**	.098	-.391**	.351**	-.377**	.360**	-.357**	.006	.313**	-.361**
Error V40	-.528**	.173	-.465**	.397**	-.359**	.300*	-.427**	-.082	.422**	-.465**
Omission V40	-.510**	.171	-.434**	.367**	-.324**	.263*	-.431**	.012	.354**	-.412**
Wrong Definition V40	.151	-.132	.071	-.022	.064	.009	.160	-.151	-.008	.027
Clang Association V40	-.015	.021	.044	-.051	.001	-.120	-.025	-.002	.016	.035
Misinterpretation V40	.167	.113	.155	-.194	.061	-.144	.158	-.084	-.095	.138

*p < .05
**p < .01

TABLE XVII

CORRELATIONS BETWEEN WORD ASSOCIATION SCORES AND PROVERB SCORES

Item	Noun-Noun	Adjective-Adjective	Verb-Verb	Total Form Class	Syntagmatic	Paradigmatic	Noun-Coordinate	Adjective-Antonym	Noun-Supraordinate	Whole-Part
Proverb Total	.157	.208	.191	.220	-.148	.149	.028	.210	-.146	.161
Proverb Omit	.149	.179	.120	.182	-.227	.240*	.066	.162	-.109	-.188
Proverb Definition	.167	.033	.163	.155	-.189	.151	-.027	.030	.150	.162
Proverb Other	-.220	-.099	-.205	-.220	.270*	-.237*	.003	-.089	-.109	-.091
Proverb General	.133	.003	.155	.124	-.074	.069	.003	.090	.057	.190
Proverb Concrete	-.224	-.107	-.234*	-.235*	.208	-.211	-.031	-.189	-.007	-.107
Proverb Metaphorical	.227	.113	.113	.198	-.233*	.213	-.096	.104	.086	.154
Proverb Mixed	-.166	-.085	-.016	-.123	.103	-.129	.139	-.109	.002	.026
Proverb Literal	-.142	-.109	-.113	-.152	.213	-.181	-.011	-.069	-.049	-.116
Proverb Rating	.226	.094	.116	.192	-.226	.202	-.044	.111	.021	.171

*p < .05

correlations which have been found for this category in the present study in that a random relationship with the other variables was obtained. Among the sample of children who gave no responses, some were aware that an analogy from the concrete content was required. For these children omits did not necessarily represent a concrete mode of organization. While the matrix yielded few significant correlations, the patterns of correlation represent consistent trends. Conceptual categories on the Proverbs test tend to show a limited association with indices of language maturity on the word association test.

Discussion. The foregoing analysis was concerned with an exploration of the patterns of correlations for the qualitative language measures. Within test analyses for the Vocabulary Test indicated significant negative correlations between Synonym V40 and Function V40 scores. Description V40 scores on the Vocabulary test showed a random relation to Synonym V40 scores. For the Word Association Test, the production of Syntagmatic responses showed a negative correlation with responses classified according to form class and semantic category. Proverb responses categorized as abstract showed significant negative correlations with categories categorized as concrete. The correlation between Synonym V40 and WISC Verbal IQ was high. Correlation coefficients for the Proverbs Test and the WISC were low to

moderate. Performance on the Word Association Test, however, showed only a random relation to performance on the WISC.

With one exception, no significant associations were obtained between the language measures and the ability to shift classes. The production of coordinate noun associates on the Word Association Test was associated with the spontaneous production of varied classes.

An analysis of the qualitative response categories indicated two basic response tendencies, i.e., a tendency toward abstract responses, and a tendency toward concrete responses. Both were evident in the protocols for the Vocabulary Test and the Proverbs Test.

Between test analyses of the language measures indicate moderate correlations between abstract response scores on the Vocabulary Test and abstract response, scores on the Proverbs Test. A similar pattern emerged for the concrete response scores on both measures. The correlational pattern which emerged for the qualitative Vocabulary scores and Word Association responses yielded no significant correlations. Studies of the relationship between associative responses and verbal ability have found that for grade six boys language skills scores were significantly correlated with number of paradigmatic responses (Tobiessen, 1964) . However, research also indicates that scores on verbal ability tests relate differently to different classes of associative responses.

The findings for the present study suggest that the construct of qualitative levels of growth in language appears to be valid.

The first question which was asked in the study was related to the degree of unity among three language measures scored to reflect qualitative levels of language growth. The degree and number of significant positive associations among the abstract language categories are presented in Table XVIII.

TABLE XVIII

CORRELATIONS AMONG ABSTRACT CATEGORIES ON MEASURES OF LANGUAGE DIFFERENTIATION

Variable	Synonym
Proverb Total	.593**
Proverb Rating	.528**
Proverb Definition	.547**
Proverb General	.469**
Proverb Metaphorical	.499**

An inspection of Table XVIII indicates that the significant correlations among the indices of greater language differentiation range from .469 to .593. Proverb responses, categorized as Proverb Definition, Proverb

General, and Proverb Metaphorical showed a significant relationship with Synonym V40 responses. Paradigmatic response and Total Form Class on WAT showed no significant relationship to abstract ratings on the other language measures. Moran (1966) has identified a word association set termed "concept-referent" which is characterized by synonym and superordinate associations. He postulates a hierarchic ranking of associative sets in terms of linguistic sophistication in the sequence: perceptual referent, object referent; concept referent. The noun coordinate category in the present study resembles the Moran's concept-referent set. However, no significant correlations were obtained in the present study for noun coordinate responses and other indices of greater language development.

Table XIX presents data concerning the significant correlations between the non-abstract responses in the language measures.

TABLE XIX

SIGNIFICANT CORRELATIONS AMONG NON-ABSTRACT RATINGS ON MEASURES OF LANGUAGE DIFFERENTIATION

Variable	Function	WAT Syntagmatic
Proverb Other	.406**	.270*
Proverb Concrete	.429**	-
Proverb Literal	.413**	-

*p < .05
**p < .01

Table XIX indicates that a tendency to be concrete when interpreting proverbs is associated with a tendency to define words in terms of a specific use or a specific action.

The data in this section formed the basis for the statistical analysis carried out to test Null Hypothesis 1 which is restated for reference:

Null Hypothesis 1: Measures of language differentiation will not be significantly related, i.e., unity of verbal habit will not be demonstrated.

On the basis of the analysis of the language protocols, the null hypothesis was partially rejected.

Reading

Two reading measures were used in the study, (1) The Van Wagenen Analytical Reading Scale, Intermediate Division, Form M, a multiple-choice reading comprehension test which measures five categories of reading skills, and (2) the Narrative Test, a test designed to provide for free response on a measure of reading.

The intercorrelations for the Van Wagenen test are presented in Table XX.

The results indicate significantly high intercorrelations between the subtests and the total score. However, the subtests, in varying degrees,

measure different aspects of the Total Score variable. The decision to use Total Scores and subscores in the analysis of data was confirmed.

TABLE XX

INTERCORRELATIONS AMONG SCORES FOR THE VAN WAGENEN ANALYTICAL READING SCALES, INTERMEDIATE DIVISION FORM M

Item	1	2	3	4	5	6
1. VW Central Thought	1.000					
2. VW Simple Details	.365**	1.000				
3. VW Related Ideas	.523**	.511**	1.000			
4. VW Inferences	.432**	.612**	.469**	1.000		
5. VW Interpretation	.354**	.481**	.562**	.567**	1.000	
6. VW Total Score	.725**	.772**	.798**	.794**	.747**	1.000

**p < .01

Correlations among the Narrative Test and the Van Wagenen subscores are presented in Table XXI.

The correlation coefficients for the Narrative Test and the Van Wagenen measures range from .335 to .559. As was indicated in the analysis reported in the Pilot Study, Appendix D, correlations between the Van Wagenen and the Narrative Test are sufficiently high to say the tests are measuring the same function, but the tests can also be viewed as sampling somewhat different sets of behavior.

TABLE XXI

CORRELATIONS BETWEEN SCORES FOR THE VAN WAGENEN ANALYTICAL READING SCALES AND THE NARRATIVE TEST

	VW					
Item	Total	Central Thought	Simple Details	Related Ideas	Infer-ences	Interpre-tation
Narrative Test	.559**	.499**	.445**	.450**	.391**	.335**

**p .01

Reading and intelligence. The correlation matrix for the measures of reading comprehension and the Wechsler Intelligence Scale for Children is presented in Table XXII. Inspection of the matrix indicates low to moderate correlations between the WISC Verbal IQ and reading, and between specific WISC Verbal subtests and reading. Sinks and Powell (1965) concluded from their study of sex and intelligence as factors in achievement in reading that

TABLE XXII

CORRELATIONS BETWEEN READING TEST SCORES AND SCORES FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Item	VW Central Thought	VW Simple Details	VW Related Ideas	VW Inference	VW Inter-pretation	VW Total	Narrative	VW + Narrative
WISC Full Scale IQ	.396**	.326**	.348**	.352**	.295**	.453**	.387**	.481**
WISC Verbal IQ	.553**	.392**	.488**	.373**	.318**	.565**	.420**	.572**
WISC Performance IQ	.118	.140	.110	.209	.190	.197	.216	.230
Information	.423**	.391**	.362**	.336**	.329**	.484**	.295**	.462**
Comprehension	.408**	.298**	.304**	.317**	.270*	.423**	.406**	.468**
Arithmetic	.238*	.189	.259*	.208	.067	.259*	.209	.269*
Similarities	.442**	.350**	.375**	.266*	.247*	.450**	.321**	.450**
Vocabulary	.533**	.315**	.492**	.350**	.178	.501**	.424**	.530**
Picture Completion	.030	.099	.013	.107	.126	.093	.135	.122
Picture Arrangement	.117	.174	.219	.205	.146	.224	.175	.230
Block Design	.105	.109	-.021	.067	.097	.094	.169	.138
Object Assembly	-.074	.085	.087	.063	.106	.062	.104	.088
Coding	.111	.039	-.077	.189	.062	.088	-.026	.050

*p < .05
**p < .01

no lasting generality concerning reading comprehension may be made on the basis of sex and intelligence. The preliminary analysis of sex differences for the present study indicated that there were no significant differences in the reading performance of boys and girls. The correlational analysis of reading and intelligence scores indicates a low to moderate association between reading and intelligence for the present study.

Reading and spontaneous flexibility. Correlations between Reading Test Scores and Spontaneous Flexibility scores are presented in Table XXIII. As indicated by Table XXIII, performance on a measure of reading comprehension is unrelated to the divergent production of semantic classes.

Reading and language. The exploration of some of the language components which may be important to reading achievement involved an analysis of the relation between reading scores and performance on tests of qualitative levels of vocabulary, word association and proverbs.

Studies generally have shown that vocabulary is highly related to reading comprehension (e.g., Davis, 1968). The present study is concerned with dimensions of word meanings. The correlational analysis of reading scores and qualitative levels of vocabulary response is presented in Table XXIV;

A significant relationship is indicated between all aspects of reading

TABLE XXIII

CORRELATIONS BETWEEN READING TEST SCORES AND SPONTANEOUS FLEXIBILITY SCORES

Item	Spontaneous Flexibility
VW Central Thought	.179
VW Simple Detail	.217
VW Related Ideas	.109
VW Inferences	.173
VW Interpretation	.055
VW Total Score	.195
Narrative	.173
VW + Narrative	.210

TABLE XXIV

CORRELATIONS BETWEEN READING TEST SCORES AND QUALITATIVE VOCABULARY SCORES

Item	VW Central Thought	VW Simple Details	VW Related Ideas	VW Inference	VW Inter-pretation	VW Total Score	Narrative	VW + Narrative
Synonym V10	.414**	.337**	.425**	.423**	.226	.480**	.380**	.497**
Function V10	-.377**	-.226	-.445**	-.315**	-.175	-.406**	-.431**	-.467**
Description V10	.015	-.183	.142	-.075	-.072	-.041	-.036	-.044
Function and Description V10	.072	.029	.069	-.028	.009	.042	.253*	.139
Total Function-Description V10	-.389**	-.329**	-.414**	-.424**	-.232*	-.469**	-.353**	-.477**
Error V10	.281*	-.112	-.150	-.040	.031	-.156	-.295*	-.235*
Synonym V40	.589**	.440**	.505**	.560**	.364**	.648**	.537**	.680**
Function V40	-.366**	-.218	-.393**	-.341**	-.221	-.404**	-.420**	-.461**
Description V40	.039	-.072	.180	.000	.015	.042	.061	.056
Function and Description V40	-.003	.013	.051	-.075	-.047	-.013	.142	.052
Total Function-Desc. V40	-.398	-.284*	-.316**	-.425**	-.271*	-.443**	-.363**	-.464**
Error V40	-.524	-.401**	-.473**	-.448**	-.301*	-.569**	-.471**	-.597**
Omission V40	-.425**	-.458**	-.479**	-.440**	-.288*	-.550**	-.433**	-.568**
Wrong Definition V40	-.000	.264*	.188	.218	.069	.189	.117	.181
Clang Association V40	-.011	.054	.029	-.037	-.003	.012	-.154	-.058
Misinterpretation V40	.033	.119	.109	-.019	.110	.090	.178	.139

*p < .05
**p < .01

measured and abstract measures of vocabulary response. Inspection of the correlation matrix for the WISC and reading measures (Table XXII) , indicated correlation coefficients of .501 between the Van Wagenen Total score and WISC Vocabulary, .424 between the Narrative Test and WISC Vocabulary, and .530 between the VW + Narrative and WISC Vocabulary, ($p < .01$ for all measures) Correlations for the Van Wagenen Total Score, the Narrative Test, and the Van Wagenen + Narrative with Synonym V40 word definitions were .648, .537, and .680 ($p < .01$ for all measures) respectively, indicating that quality of definition is an effective instrument for assessing levels of reading comprehension.

The production of Synonym V40 responses was significantly related to all aspects of reading performance. Approximately 42 percent of the variance of the Van Wagenen total score is predictable from the variance of Synonym V40; approximately 46 percent of the variance of the combined Van Wagenen and Narrative score is predictable from the variance of Synonym V40. The production of functional definitions showed a negative correlation with all measures of reading. Significant correlations were obtained with all measures except Simple Details and Interpretation. The production of Function V40 responses thus has a negative relation to such comprehension skills as the ability to see ideas expressed in paragraphs, and the ability to go beyond statements in paragraphs in forming inferences.

Correlations with the Description category were approximately zero indicating that this definitional level of response had little implication for reading as measured in this study. An analysis of errors indicated that Omissions show a high negative correlation with reading.

Reading and word association . Table XXV presents the correlation coefficients for reading and measures of Word Association. Correlations between reading and Syntagmatic responses approached zero but were consistently negative. Correlations between reading and Paradigmatic responses also approached zero but were positive. The production of noun-noun responses showed a low but significant correlation with Inference measures in reading, with the Van Wagenen Total Score, and with the Van Wagenen and Narrative score ($p < .05$). The verb-verb response score and the total Form Class score obtained a low but significant correlation with Interpretation measures ($p < .05$).

Reading and proverbs. The matrix of intercorrelations among reading and proverb ratings is presented in Table XXVI.

The correlations between the proverb and reading measures indicate a consistent pattern of performance. The abstract levels of verbal response on the Proverbs Test demonstrate consistent and positive significant correlations with all measures of reading. In contrast, the more primitive levels of Proverb

TABLE XXVI

CORRELATIONS BETWEEN READING TEST SCORES AND PROVERB SCORES

Item	VW Central Thought	VW Simple Details	VW Related Ideas	VW Inference	VW Inter-pretation	VW Total Scores	Narrative	VW + Narrative
Proverb Correct	.369**	.351**	.413**	.332**	.321**	.466**	.482**	.531*
Proverb Omit	.262*	-.100	-.222	-.159	-.130	-.230	-.219	-.253*
Proverb Definition	.472**	.437**	.552**	.265*	.391**	.555**	.478**	.591**
Proverb Other	-.371**	-.395**	-.464**	-.204	-.339**	-.465**	-.393**	-.492**
Proverb General	.484**	.370**	.376**	.339**	.419**	.519**	.367**	.518**
Proverb Concrete	-.380**	-.340**	-.288*	-.276*	-.386**	-.435**	-.286*	-.425**
Proverb Metaphorical	.381**	.341**	.546**	.302*	.304**	.493**	.458**	.539**
Proverb Mixed	.083	.171	.015	.043	.022	.088	.138	.121
Proverb Literal	-.326**	-.421**	-.458**	-.279*	-.264*	-.459**	-.458**	-.516**
Proverb Rating	.374**	.411**	.505**	.304**	.282*	.493**	.514**	.563**

*p < .05
**p < .01

TABLE XXV

CORRELATION BETWEEN READING TEST SCORES AND WORD ASSOCIATION SCORES

Item	WAT Noun-Noun	WAT Adjective-Adjective	WAT Verb-Verb	WAT Total Form Class	WAT Syntagmatic	WAT Paradigmatic	WAT Noun-Coordinate	WAT Adjective-Antonym	WAT Noun-Superordinate	WAT Whole-Part
VW Central Thought	.211	-.028	.006	.016	-.157	.106	-.055	.142	.027	.145
VW Simple Details	.153	-.074	.027	.066	-.034	.018	.079	.017	-.014	.045
VW Related Ideas	.176	-.030	-.029	.074	-.131	.105	-.204	.092	.076	.079
VW Inference	.236*	-.072	-.031	.092	-.067	.048	-.002	-.003	-.003	.062
VW Interpretation	.230	.084	.265*	.241*	-.184	.187	.108	.096	.036	-.042
VW Total Score	.264*	-.034	.053	.147	-.149	.136	-.026	.092	.030	.081
Narrative	.176	.107	.044	.146	-.158	.141	-.008	.135	.015	.144
VW + Narrative	.258	.023	.055	.165	-.171	.155	-.021	.122	.027	.118

*p < .05

response showed a consistent and significant negative correlation with the reading measures. Correlations for Proverbs Mixed, which represented a transitional stage between less abstract and more abstract responses, approached zero. The results indicate that the concepts, "abstract" and "concrete" as they apply to Proverb responses are meaningful qualitative differences.

A correlation coefficient of .555 was obtained between VW Total Score and Proverb Definition, a response designed to say what the proverb means. The correlation for VW Total Score and Proverb General, a response which is a general statement of antecedent-consequent relations, was .519. The highest correlation with the Narrative Test was obtained by Proverb Rating, a score derived from an assessment of Proverb responses as relatively concrete or abstract.

Discussion. The correlation matrix obtained for the Van Wagenen reading subscores suggests that reading is not an unitary process. The findings indicate low correlations between Simple Details and Central Thought ($r = .365$), and between Interpretation and Central Thought ($r = .354$). The correlation coefficient for Inferences and Simple Details is .432. The overall findings indicate that reading comprehension, as measured by a multiple-choice reading test and a free response measure, is significantly related to levels of language differentiation defined in terms of qualitative

level of response in a Vocabulary Test and a Proverbs Test. Low to moderate positive correlations were found between reading and the tendency to define words in terms of a synonym or class membership. At the same time, the production of definitions in terms of use is negatively correlated with reading performance. The production of definitions based on perceptible attributes of the referent shows a random relation to performance on a reading comprehension test. Patterns of correlation for reading and word association are consistent for two categories of associative response. Paradigmatic responses, which are characteristic of older children and adults, showed a positive relation to reading performance, while Syntagmatic responses, which are associative responses characteristic of younger children, showed a negative correlation with reading. The overall pattern of correlations for reading and Word Association indicates that for most of the Word Association categories, a random relation with reading exists. Reading comprehension shows a moderate correlation with the ability to perceive proverbs as metaphorical, as general statements and as subject to interpretation.

The data in this section formed the basis for the statistical analysis carried out to test Null Hypothesis 2 which is restated for reference:

Null Hypothesis 2: Performance on measures of reading

comprehension is not significantly related to performance on measures of language differentiation.

In view of the findings, Null Hypothesis 2 was partially rejected.

Cognitive Style

Measures of two cognitive styles were employed in an investigation of individual differences in cognitive functioning. The styles tested were field dependence-independence and Conceptual Differentiation. The results of the data analysis are presented separately for each style in the sections which follow.

Field dependence-independence.

Witkin's Embedded Figure Test was employed as an instrument to assess the cognitive style, field dependence-independence. The pupil's score was the solution time for each test item. A high solution time indicates relatively greater field dependence.

The mean time taken to complete each test was 1896.20 seconds which is approximately 665 seconds longer than the mean time reported by Witkin for eleven-year old subjects (Witkin, Temporary Manual).

Preliminary analysis of the data indicated that the girls in this sample were more field dependent than the boys ($t = 2.056$, $p < .05$). Small but significant sex differences have been reported in studies of

TABLE XXVII

CORRELATIONS BETWEEN EMBEDDED FIGURES TEST SCORES AND SCORES FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Item	Embedded Figures Test
WISC Full Scale IQ	-.511**
WISC Verbal IQ	-.444**
WISC Performance IQ	-.445**
Information	-.432**
Comprehension	-.347**
Arithmetic	-.212
Similarities	-.407**
Vocabulary	-.245**
Picture Completion	-.162
Picture Arrangement	-.145
Block Design	-.606**
Object Assembly	-.417**
Coding	-.044

*p < .05
**p < .01

field independence. Finding for ten- and eleven-year-olds are somewhat equivocal however.

Correlations between the Embedded Figures Test and the Wechsler Intelligence Scale for Children are presented in Table XXVII. As indicated by Table XXVII significant negative correlations were obtained between field dependence and the WISC Full Scale IQ, the WISC Verbal IQ, and the WISC Performance IQ. Witkin et al. (1962, p. 61) have reported that relations between perceptual field dependence and intelligence tend to be somewhat higher for the WISC Performance Scale than for the WISC Verbal Scale. Inspection of Table XXVII indicates that these differences do not hold for the present study. The relation between field dependence-independence and total intelligence test scores is reported to be "carried" largely by subtests of the intelligence scale which require analytical functioning, e.g., Block Design, Picture Completion and Object Assembly. In the present study the correlation coefficient for Field Dependence-Independence and Block Design was -.60.

Table XXVIII presents the correlation coefficient for the Embedded Figures Test and Spontaneous Flexibility. As indicated in Table XXVIII field dependence-independence as measured in this study is not related to Spontaneous Flexibility.

Conceptual differentiation. The criterion measure of the cognitive

TABLE XXVIII

CORRELATIONS BETWEEN EMBEDDED FIGURES TEST SCORES AND SPONTANEOUS FLEXIBILITY SCORES

Item	Embedded Figures Test
Spontaneous Flexibility	-0.126

style, Conceptual Differentiation is the Object Sorting Test. Two major scores which were derived from the Object Sorting Test were total-number-of-groups score and preferred Level of Abstraction Score. Subjects high in conceptual differentiation tend to group objects into a relatively large number of small groups, while the subject with low conceptual differentiation demonstrate a preference for a smaller number of broad groupings.

Sex comparisons on the scores derived from the Object Sorting Test indicated no significant differences in the performance of boys and girls. These findings are consistent with those reported by Gardner and Moriarty (1968) for children and also with those reported for adult samples.

Table XXIX presents the correlation matrix for children's grouping and abstraction scores. The results indicate a significant positive correlation between the mean level of abstraction and the total number of groups the subjects formed. Gardner and Schoen (1962) have demonstrated that for adults the total number of groups formed (i.e., conceptual differentiation) is uncorrelated with the mean level of abstraction determined from the subject's reasons for grouping in the Object Sorting Test. However, in a factor analysis of cognitive control scores of children, Gardner and Moriarty (1968) found that preferred level of abstraction obtained a positive loading (.37) on a conceptual differentiation factor. This finding suggested that preferred level of abstraction may be an important

TABLE XXIX

INTERCORRELATIONS AMONG GROUPING AND ABSTRACTION SCORES FOR THE OBJECT SORTING TEST

Object Sorting	1	2	3	4	5	6	7	8	9
1. Number of Groups of Two or More Objects	1.000								
2. Number of Single Objects	.225	1.000							
3. Number of Groups	.755**	.778**	1.000						
4. Average Number of Objects per Group	-.856**	-.466**	-.827**	1.000					
5. Mean Level of Abstraction	.342**	.343**	.451**	-.454**	1.000				
6. Percentage Conceptual	.179	.225	.266**	-.279*	.808**	1.000			
7. Percentage Functional	.318**	.180	.328**	-.332**	.155	-.377**	1.000		
8. Percentage Concrete	-.447**	-.361**	-.533**	.548**	-.848**	-.528**	-.587**	1.000	
9. Percentage Conceptual and Functional	.448**	.362**	.534**	-.548**	.848**	.528**	.587**	-1.000	1.000

*p < .05
**p < .01

determinant of the number of groups formed by children. The results for the present study suggest that abstraction may be related to conceptual differentiation when the subjects are children.

The average level of abstraction score for the present study was 1.9. Gardner and Moriarty (1968) report a level of abstraction score close to 2.0, the level of functional definition.

The correlation coefficients for the Object Sorting Test and the Wechsler Intelligence Scale for Children are presented in Table XXX. As indicated by Table XXX the relation between intelligence and grouping preferences tends to be a random one. The findings are consistent with those of Gardner and Moriarty (1968) who found a "general independence" of WISC and Object Sorting scores at preadolescence. Gardner and Schoen (1962) report that, for adults, conceptual differentiation and preferred level of abstraction are not related to Verbal, Performance, and Total IQ scores of the Weschler-Bellevue Test, to capacity to abstract as measured by the Wechsler-Bellevue Similarities subtest. In the present study mean level of abstraction is significantly correlated ($r = .348$, $p < .01$) with the WISC Arithmetic subtest. Level of abstraction is not related to capacity to abstract as measured by the WISC Similarities subtest.

Table XXXi presents the correlation between the grouping and abstraction scores on the Object Sorting Test and Spontaneous Flexibility. Messick and Kogan (1963) have suggested that formation of single-object

TABLE XXX

CORRELATIONS BETWEEN GROUPING AND ABSTRACTION SCORES FOR THE OBJECT SORTING TEST AND SCORES FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Item	W I S C												
	Full Scale IQ	Verbal IQ	Perf. IQ	Inf.	Comp.	Arith.	Sim.	Voc.	P. C.	P. A.	B. D.	O.A.	Cod.
Number of Groups of Two or More Objects	-.123	-.067	-.181	.015	-.055	.044	-.106	-.002	-.154	-.112	-.176	-.005	-.105
Number of Single Objects	-.039	.042	-.141	.020	-.017	.139	.067	-.016	-.055	-.038	.080	-.090	-.184
Number of Groups	-.132	-.035	-.234*	.007	-.086	.118	-.019	-.023	-.182	-.109	-.067	-.082	-.177
Average Number of Objects per Group	.107	.033	.183	-.032	.080	-.133	.065	.023	.188	.093	.099	.058	.085
Level of Abstraction	.107	.123	.017	.210	-.031	.348**	.098	.077	-.167	.127	.087	.066	-.066
Percentage Conceptual	.249*	.286*	.106	.262*	.171	.320**	.219	.261*	-.090	.168	.159	.090	.001
Percentage Functional	-.231	-.271*	-.135	-.070	-.330**	-.043	-.215	-.280*	-.073	-.081	-.132	-.045	-.035
Percentage Concrete	-.007	-.002	.030	-.166	.153	-.241*	.005	.028	.145	-.072	-.019	-.038	.029
Percentage Conceptual and Functional	.006	.001	-.031	.165	-.154	.241*	-.005	-.029	-.146	.072	.018	.037	-.031

*p < .05
**p < .01

TABLE XXXI

CORRELATIONS BETWEEN GROUPING AND ABSTRACTION SCORES FOR THE OBJECT SORTING TEST AND SPONTANEOUS FLEXIBILITY SCORES

Item	Spontaneous Flexibility
Number of Groups of Two or More Objects	-.222
Number of Single Objects	.014
Number of Groups	-.115
Average Number of Objects per Group	.237*
Level of Abstraction	-.002
Percentage Conceptual	-.017
Percentage Functional	-.014
Percentage Concrete	.029
Percentage Conceptual and Functional	-.028

* $p < .05$

categories is indicative of compartmentalization, a quality associated with rigidity or perseversation in thinking. Table XXXI indicates that ability to shift classes as measured in the present study is not significantly (.01 level) related to performance on the Object Sorting Test. A correlation coefficient of .237 ($p < .05$) was obtained for Spontaneous Flexibility and the average-number-of objects per group.

Table XXXII presents the product-moment correlations between the scores obtained on the Embedded Figures Test and the Object Sorting Test. The findings presented are in agreement with the findings in the related research concerning adult samples. The correlation coefficient for the Embedded Figures Test and the total-number-of-groups score is .163 suggesting that Field dependence-independence and Conceptual Differentiation are independent cognitive styles. The low but significant (.05 level) correlation between the Embedded Figures Test and the score for the number of groups excluding single objects was not expected. For the present study, percentage of abstract responses in an Object Sorting Test shows some association with field independence.

Discussion. The foregoing section was concerned with an analysis of the data relevant to the cognitive styles, field dependence-independence and conceptual differentiation. Small but significant (.05 level) sex differences in performance on the Embedded Figures Test indicate that girls in the present sample tend to be more field dependent than boys. No

TABLE XXXII

CORRELATIONS BETWEEN EMBEDDED FIGURES TEST SCORES AND GROUPING AND ABSTRACTION SCORES FOR THE OBJECT SORTING TEST

Item	Embedded Figures Test
Number of Groups of Two or More Objects	.235*
Number of Single Objects	.014
Number of Groups	.163
Average Number of Objects per Group	-.174
Level of Abstraction	-.134
Percentage Conceptual	-.252*
Percentage Functional	.211
Percentage Concrete	.028
Percentage Conceptual and Functional	-.027

*$p < .05$

significant differences in the performance of boys and girls were obtained for the Object Sorting Test. Significant negative correlations were obtained between field dependence and intelligence. However, intelligence, as measured by the WISC, is not an important determiner of conceptual differentiation. Although grouping and abstraction scores are independent measures for adult samples, preferred level of abstraction may be associated with the number of groups formed by children in an object sorting test. The results of the correlational analysis indicate that the capacity to isolate embedded figures as measured by the Embedded Figures Test is unrelated to grouping preference in an Object Sorting Test. The following Null Hypothesis was presented and tested to answer questions concerning cognitive styles:

Null Hypothesis 3: Performance on a measure of Field Dependence-Independence is not significantly related to performance on a measure of conceptual differentiation.

In view of the findings of no significant relation between Field dependence-independence and the total-number-of-groups score in a free categorizing task (conceptual differentiation) Null Hypothesis 3 is rejected.

Cognitive Style and Measures of Language

The research literature has generally indicated that the cognitive styles of Field dependence-independence and Conceptual Differentiation are

unrelated to verbal ability. However significant correlations between these cognitive styles and verbal ability have been reported in individual studies (e.g., Crandall and Sinkeldam 1964; Messick and Kogan, 1963).

The following section examines the patterns of correlation for the cognitive style and language measures.

Field-dependence-independence and language. Table XXXIII presents the product-moment correlations for field dependence-independence and vocabulary. As indicated by Table XXXIII Field Independence is significantly related to the production of Synonym responses to the total WISC Vocabulary subtest. The correlation between Field Independence and Synonym V10 approaches zero. The use of more complex material in the Vocabulary Test is accompanied by an increasing association between the abstract vocabulary response and Field Independence. Field Dependence shows a significant relation with the Error and Omission scores. Field Dependence is also associated (.05 level) with the production of Function and Description responses on the Vocabulary Test.

Table XXXIV presents the correlation coefficients for Field dependence-independence and Word Association. As indicated by Table XXXIV Field dependence-independence and performance on a Word Association Test are unrelated. In view of the findings by Kagan et al. (1964) that the production of coordinate noun associates is moderately related to the analytic attitude at the grade two level, a relationship was

TABLE XXXIII

CORRELATIONS BETWEEN EMBEDDED FIGURES TEST SCORES AND QUALITATIVE VOCABULARY SCORES

Item	Embedded Figures Test
Synonym V10	-.073
Function V10	.042
Description V10	.042
Function and Description V10	-.009
Total Function and Description V10	.062
Error V10	.112
Synonym V40	-.364**
Function V40	.118
Description V40	.121
Function and Description V40	.068
Total Function and Description V40	.247*
Error V40	.325**
Omission V40	.341**
Wrong Definition V40	-.105
Clang Association V40	-.119
Misinterpretation V40	-.122

*p < .05
**p < .01

TABLE XXXIV

CORRELATIONS BETWEEN EMBEDDED FIGURES TEST SCORES AND WORD ASSOCIATION SCORES

Item	Embedded Figures Test
WAT Noun-Noun	.005
WAT Adjective-Adjective	.140
WAT Verb-Verb	.021
WAT Total Form Class	.058
WAT Syntagmatic	-.109
WAT Paradigmatic	.112
WAT Noun-Coordinate	.009
WAT Adjective-Antonym	.180
WAT Noun- Supraordinate	-.073
WAT Whole-Part	.071

postulated. For the present study all correlation coefficients are close to zero.

The correlations between Field dependence-independence and the Proverb scores are presented in Table XXXV. As indicated by Table XXXV, there are low but significant correlations between Field Independence and the number of proverbs interpreted correctly between Field Independence and scores for the abstract categories Proverb Definition, Proverb Metaphorical and between Field Independence and the Proverb rating. Field dependence shows a positive relation with the production of concrete responses labelled Other, Concrete, and Literal ($p < .05$).

Conceptual differentiation and language. The correlation matrix for the grouping and abstraction scores of the Object Sorting Test and the qualitative vocabulary scores is presented in Table XXXVI. The results indicate that the number of groups produced in a free categorizing situation is unrelated to word definition when it is scored for the qualitative level of response.

The results for the level of abstraction scores tend to confirm the postulation that for children, the mean level of abstraction on an Object Sorting Test is associated with vocabulary. Conceptual definitions of groups in the Object Sorting Test shows a low but significant correlation with Synonym V10. Functional definitions for groupings are related to the

TABLE XXXV

CORRELATIONS BETWEEN EMBEDDED FIGURES TEST SCORES AND PROVERB SCORES

Item	Embedded Figures Test
Proverb Correct	-.305**
Proverb Omit	.067
Proverb Definition	-.309**
Proverb Other	.281*
Proverb General	-.281
Proverb Concrete	.273
Proverb Metaphorical	-.316**
Proverb Mixed	.021
Proverb Literal	.266*
Proverb Rating	-.343**

*p < .05
**p < .01

TABLE XXXVI

CORRELATIONS BETWEEN GROUPING AND ABSTRACTION SCORES FOR THE OBJECT SORTING TEST AND QUALITATIVE VOCABULARY SCORES

Item	GROUPING				ABSTRACTION				
	No. Groups Two or More Objects	No. Single Objects	No. of Groups	Average No. Obj. per Group	Level of Abstraction	Percentage Conceptual	Percentage Functional	Percentage Concrete	Percentage Conceptual + Functional
Synonym V10	-.003	-.015	.006	-.057	.164	.271*	-.206	-.048	.048
Function V10	-.034	.089	.067	.034	-.024	-.172	.279*	-.106	.106
Description V10	.058	-.030	.041	-.052	.038	-.025	-.005	.027	-.027
Function and Description V10	.008	-.108	-.161	.078	-.238*	-.087	-.206	.264*	-.265*
Total Function-Description V10	-.008	.018	-.012	.069	-.172	-.272*	.187	.066	-.067
Error V10	.099	-.026	.053	-.105	.052	-.019	.196	-.163	.163
Synonym V40	-.051	-.030	-.046	-.003	.175	.355**	-.321**	-.016	.016
Function V40	-.070	.100	.032	.058	-.123	-.237	.216	.010	-.010

TABLE XXXVI
(continued)

Item	GROUPING				ABSTRACTION				
	No. Groups Two or More Objects	No. Single Objects	No. of Groups	Average No. Objects per Group	Level of Abstraction	Percentage Conceptual	Percentage Functional	Percentage Concrete	Percentage Conceptual + Functional
Description V40	.102	.008	.105	-.085	.033	-.009	-.010	.016	-.017
Function and Description V40	.056	-.157	-.143	.071	-.212	-.103	-.108	.189	-.189
Total Function-Description V40	.012	.038	.024	.053	-.230	-.329**	.183	.119	-.119
Error V40	.066	.012	.048	-.046	-.046	-.227	.316**	-.091	.091
Omission V40	.107	.180	.195	-.140	.042	-.177	.355**	-.170	.170
Wrong Definition V40 C	-.098	-.281*	-.240*	.169	-.092	.010	-.131	.111	-.111
Clang Association V40	-.124	-.171	-.177	.154	-.195	-.098	-.063	.143	-.144
Misinterpretation V40	.028	-.166	-.185	.063	-.072	.036	-.229	.179	-.179

*p. < .05
**p. < .01

number of Errors and Omissions on a Vocabulary Test and shows a negative correlation with the production of Synonym V40 responses.

The correlations between the grouping and abstraction scores of the Object Sorting Test and Proverbs are presented in Table XXXVII. An inspection of Table XXXVII reveals that the cognitive style conceptual differentiation is unrelated to performance on a Proverbs Test. However, conceptual definitions for groups show significant positive correlations with Proverb Definition (.410, $p < .01$), Proverb Metaphorical (.330, $p < .01$), and Proverb Rating (.398, $p < .01$).

Table XXXVIII presents the correlation matrix for grouping and abstraction scores of the Object Sorting Test and Word Association responses. The findings for the total-number-of-groups score (conceptual differentiation) and word association indicate a random relationship. These results are consistent with those obtained for conceptual differentiation and the vocabulary and proverb measures. With one exception, preferred Level of Abstraction scores are not associated with Word Association scores. A preference for Functional responses on the Object Sorting test shows a low negative correlation with Noun-Noun associative responses ($r = -.275$, $p < .05$).

Discussion. Research has shown that the cognitive styles field-dependence-independence and conceptual differentiation are related to at least certain types of verbal functioning. The present study is concerned with

TABLE XXXVII

CORRELATIONS FOR GROUPING AND ABSTRACTION SCORES OF THE OBJECT SORTING TEST AND PROVERB SCORES

Item	PROVERB RESPONSES									
	Correct	Omit	Definition	Other	General	Concrete	Meta-phorical	Mixed	Literal	Rating
Number of Groups of Two or More Objects	-.031	.020	.073	-.080	-.083	.104	-.005	-.015	-.017	-.012
Number of Single Objects	-.110	.125	.007	-.053	-.098	.024	-.065	.124	-.073	-.041
Number of Groups	-.062	.066	.050	-.074	-.098	.079	-.034	.052	-.047	-.039
Average Number of Objects per Group	-.009	-.068	-.154	.177	.027	.001	-.053	-.068	.136	-.075
Level of Abstraction	.126	.162	.271*	-.328**	.036	-.146	.242*	.042	-.328**	.290*
Percentage Conceptual	.154	.136	.410**	-.456**	.100	-.195	.330**	.097	-.441**	.398**
Percentage Functional	-.113	.088	-.198	.164	-.117	.062	-.233	.022	.177	-.203
Percentage Concrete Responses	-.032	-.199	-.178	.249*	.019	.114	-.076	-.105	.225	-.163
Percentage Conceptual and Functional Responses	.030	.199	.177	-.248*	-.020	-.113	.075	.105	-.224	.161

*p < .05
**p < .01

TABLE XXXVIII

CORRELATIONS BETWEEN GROUPING AND ABSTRACTION SCORES FOR THE OBJECT SORTING TEST AND WORD ASSOCIATION SCORES

Item	WORD ASSOCIATION									
	Noun-Noun	Adjective-Adjective	Verb-Verb	Total Class Form	Syntagmatic	Paradigmatic	Noun-Coordinate	Adjective-Antonym	Noun-Superordinate	Whole-Part
Number of Groups of Two or More Objects	.034	-.048	-.130	-.042	.055	-.062	.032	-.109	-.062	.068
Number of Single Objects	-.095	-.211	-.153	-.175	.185	-.187	.228	-.191	.156	-.209
Number of Groups	-.057	-.186	-.186	-.157	.175	-.180	.159	-.213	.076	-.094
Average Number of Objects per Group	-.039	.096	.100	.046	-.065	.080	-.098	.222	-.046	-.044
Level of Abstraction	.096	-.038	-.053	.021	.059	-.110	-.020	-.092	.146	.021
Percentage Conceptual	.217	-.099	-.107	.047	-.002	-.034	-.015	-.104	.186	.090
Percentage Functional	-.275*	-.032	-.004	-.160	.120	-.142	-.095	-.058	-.071	-.080
Percentage Concrete	.062	.114	.095	.104	-.107	.159	.099	.144	-.098	-.005
Percentage Conceptual and Functional	-.062	-.116	-.097	-.106	.108	-.160	-.100	-.145	.098	.005

*$p > .05$

language differentiation, which is defined in terms of abstract responses on a Vocabulary Test and Proverbs Test, and in terms of paradigmatic responses on a Word Association Test. Limited language differentiation is defined in terms of responses defined as concrete, literal and syntagmatic on the respective tests. The results indicate low but significant correlations between Field Indpendence and abstract responses on the Vocabulary Test, and Proverbs Test. Developed language differentiation as represented by these language tests may be considered to be related to differentiation as represented in the tendency to be field independent. Language differentiation, however, is unrelated to the differentiation an individual imposes in a free categorizing task. The mean level of abstraction score on an Object Sorting Test shows significant positive correlations with abstract scores on the Vocabulary and Proverbs language measures.

The data in this section formed the basis for the statistical analysis carried out to test Null Hypothesis 4, which is restated for reference:

Null Hypothesis 4: Performance on measures of language differentiation is not significantly related to performance on measures of cognitive style.

In view of the findings the null hypothesis was partially rejected.

Cognitive Style and Reading Performance

The relation between cognitive style and performance on tests of

reading comprehension is discussed in the following section.

Field dependence-independence and reading. Table XXXIX presents the correlation coefficients for the Embedded Figures Test and the reading test scores. As indicated by Table XXXIX there is a low but significant correlation between field independence and the major reading scores, VW Total Score, Narrative, and VW + Narrative. A consistent trend is noted for all reading scores. Significant correlations were obtained for the subscales Simple Details and Interpretation. The Simple Details subtest included questions of the type: An insect hatches from an egg into a (1) pupa, (2) larva, (3) cocoon, (4) chrysalis, and (5) mosquito. The Interpretation subtest included such questions as: The forest fire was caused by (1) a heavy wind, (2) Fred's carelessness, (3) a rabbit, (4) someone's setting it on fire and (5) a thunder shower.

The pattern of correlations which was obtained suggests the feasibility of investigating reading performance in terms of specific skills.

Conceptual differentiation and reading. The product-moment correlations for the grouping and abstraction scores on the Object Sorting Test and reading are presented in Table XL. The results clearly indicate that the total-number-of-groups score (conceptual differentiation) is unrelated to the reading scores derived in this study. An examination of Level of Abstraction scores indicates that significant patterns may be revealed when

TABLE XXXIX

CORRELATIONS BETWEEN EMBEDDED FIGURES TEST SCORES AND READING TEST SCORES

Item	Embedded Figures Test
VW Central Thought	-.406**
VW Simple Details	-.236*
VW Related Ideas	-.403**
VW Inferences	-.268*
VW Interpretation	-.260*
VW Total Score	-.410**
Narrative	-.362**
VW + Narrative	-.438**

*p < .05
**p < .01

TABLE XL

CORRELATIONS BETWEEN GROUPING AND ABSTRACTION SCORES FOR THE OBJECT SORTING TEST AND READING TEST SCORES

Item	VW Central Thought	VW Simple Details	VW Related Ideas	VW Inferences	VW Inter-pretation	VW Total Score	Narrative	VW + Narrative
Number of Groups of Two or More Objects	-.080	-.017	-.051	.014	-.167	-.076	-.152	-.118
Number of Single Objects	.025	.045	-.160	.029	-.042	-.022	-.040	-.033
Number of Groups	-.005	.023	-.132	.057	-.147	-.047	-.153	-.099
Average Number of Objects per Group	.064	-.012	.026	-.099	.007	-.001	.145	.062
Level of Abstraction	.126	.248*	.201	.133	.048	.202	.215	.233*
Percentage Conceptual	.321**	.411**	.319**	.280*	.191	.405**	.276*	.400**
Percentage Functional	-.297*	-.274*	-.270*	-.278*	-.284*	-.369**	-.228	-.354**
Percentage Concrete	-.009	-.109	-.031	.010	.093	-.016	-.033	-.026
Percentage Conceptual and Functional	.009	.109	.031	-.010	-.094	.016	.033	.025

*p < .05
**p < .01

style were explored in a correlational analysis. Language differentiation was defined in terms of progression toward greater abstractness, and responses were assessed for relative concrete or abstract qualities. The tendency to produce paradigmatic responses on a word association test was examined within this context. The relation of qualitative levels of response to reading performance and to cognitive style was assessed and the relation of cognitive style to reading was determined. The global-articulated dimension of cognitive functioning was considered. The study asked whether developed differentiation as indicated by the cognitive style field independence is associated with greater articulation in language.

As individual differences in the process of categorizing input may represent another variety of differentiation, the relation of the cognitive style conceptual differentiation to all variables was examined. The study considered whether qualitative levels of language response and performance on tests of reading comprehension were associated with broad or narrow grouping. The relation of the cognitive style field dependence-independence to conceptual differentiation was determined.

Analysis of the language protocols indicated that no one type of qualitative response is used exclusively by the children. Of interest, however, is the type of response which predominates.

Inspection of the correlation matrices indicated the following results. The findings suggested that the construct of qualitative levels of growth

the percentage of responses at each conceptual level is considered. The tendency to give conceptual definitions for groupings shows a significant positive correlation with four of the scores derived from the Van Wagenen. Scale. Functional responses show a significant negative correlation with the Van Wagenen Total Score. The production of concrete responses is unrelated to performance on a measure of reading.

Discussion. A significant correlation was obtained between reading performance and the cognitive style, Field Independence. The cognitive style Conceptual Differentiation shows no relation with reading.

The data on the relationship between cognitive style and reading formed the basis for the analysis of Null Hypothesis 5 which is restated for reference:

Null Hypothesis 5: Performance on measures of reading comprehension is not significantly related to performance on measures of cognitive style. The present results indicate a positive correlation between reading and field independence. However, conceptual differentiation, as indicated by the total-number-of-groups score on an object sorting test is unrelated to reading. The Null Hypothesis is therefore partially rejected.

Summary

Interrelations among scores for language, reading, and cognitive

in language is valid. The analysis of the language protocols indicated that the abstract-concrete dimension is a valid one for examining performance in reading. Unity in verbal habit was obtained across the Proverb and Vocabulary measures but not across the Word Association measure. The ability to produce categorical responses on proverb and vocabulary measures is significantly related to reading comprehension. Field-independent behavior is associated with high scores in reading comprehension. The cognitive style, conceptual differentiation, appears to be an independent variable, however, and the number of groups produced in an object sorting test is unrelated to reading comprehension and qualitative measures of language.

The significant correlations between field dependence-independence and the categorical responses on the language measures suggest a possible relationship between psychological differentiation and language differentiation.

The findings of two independent cognitive styles suggest that subjects may have widely differing patterns of styles. It should therefore be possible to define behavior in terms of the different patterns of performance.

III. LANGUAGE AND IQ VARIABLES AS PREDICTORS OF READING ACHIEVEMENT

The best predictors of reading comprehension among the language

and IQ measures were tested by carrying out a stepwise regression analysis with each of the following reading measures as criterion: Van Wagenen and Narrative Test, Van Wagenen Total Score, Narrative Test, Central Thought Subscore, Simple Details Subscore, Related Ideas Subscore, Inferences Subcore, and Interpretation Subscore. Language and IQ variables were considered together as predictors.

Tables XLI to XLVII list the variables that made a significant contribution to prediction of the reading scores in the order that they were entered into the regression equations; F ratios (F_R) for testing the significance of the multiple correlations; probabilities (P_R), of observing F ratios as large as F_R; the percentage of the criterion variance accounted for by the predicted scores; and the best prediction equation.

The specified level of significance for adding and deleting variables was .10.

Table XLI lists the language and IQ variables that made a significant contribution to prediction of the VW + Narrative score in the order that they were entered into the regression equation.

The multiple correlation between the Total Reading score and the composite predicted scores produced by the regression equation involving Synonym V40, Proverb Definition, Noun-Noun, Proverb Other, and Total Function and Description scores indicated that 60.28 percent of the variance of the criterion was accounted for by the predicted scores. Synonym V40,

TABLE XLI

SIGNIFICANT PREDICTORS OF VAN WAGENEN TOTAL SCORES IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation[a]	F R	P R	Percentage of Variance Accounted for
1	Synonym V40	50.650	0.000	41.979
2	Synonym V40, Proverb General	7.866	0.006	47.917
3	Synonym V40, Proverb General, WISC Verbal IQ	4.648	0.034	51.250
4	Synonym V40, Proverb General, WISC Verbal IQ, WAT Noun-Noun	4.503	0.037	54.321
Best Prediction Equation	$\hat{X}_{VW\ Tot.} = 40.055 + 0.1653X_{WISC\ Verbal\ IQ} + 0.3939X_{WAT\ Noun\text{-}Noun} + 1.7575X_{Prov.\ Gen.} + 0.5825X_{Synonym\ V40}$			

[a]Variables are listed according to their value as a predictor, beginning with Synonym 40 which was the single best predictor

by itself, accounted for 46.31 percent of the variability associated with the dependent variable. The appearance of Proverb Other and Total Function and Description as positive predictor variables was not expected. As both kinds of response represent a concrete approach in language function their presence suggests that the nature of the thinking represented by the variables may have relevance for particular aspects of reading.

Table XLII, lists the language and IQ variables which made a significant contribution to the production of scores on the Van Wagenen total scale.

As can be seen from Table XLII, the first variable entered into the equation was Synonym V40, followed by Proverb General, WISC Verbal, and WAT Noun-Noun. Fifty-four percent of the variance of the criterion was accounted for by the predicted scores. Forty-one percent of the variability in reading comprehension scores was held in common with abstract response scores obtained in a qualitative measure of vocabulary. Adding WISC Verbal IQ to the two best predictor variables, Synonym V40 and Proverb General, produced an increase of only 3 percent in the proportion of variability of the Van Wagenen Total score which could be ascribed to variability in the independent variables.

Table XLIII, presents the language and IQ variables that made a significant contribution to prediction of Narrative Scores in the order that they were entered into the regression equation.

TABLE XLII

SIGNIFICANT PREDICTORS OF VAN WAGANEN TOTAL SCORE AND NARRATIVE SCORE IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation	F R	P R	Percentage of Variance Accounted for
1	Synonym V40	60.367	0.000	46.305
2	Synonym V40, Proverb Definition	10.019	0.002	53.114
3	Synonym V40, Proverb Definition, WAT Noun-Noun	3.7616	0.0565	55.5717
4	Synonym V40, Proverb Definition, WAT Noun-Noun	3.5279	0.0646	57.7941
5	Synonym V40, Proverb Definition, WAT Noun-Noun, Proverb Other, Total Function and Description V40	4.1246	0.0462	60.2766

Best Prediction Equation

$$\hat{X}_{VW + Nar.} = 30.357 + 0.5681X_{WAT\ Noun\text{-}Noun} + 4.7877X_{Prov.\ Def.} + 3.0219X_{Prov.\ Other}$$
$$+ 1.5920X_{Tot.\ Func.\text{-}Descrip.\ V40} + 1.777X_{Xyn.\ V40} = Syn.\ V40.$$

TABLE XLIII

SIGNIFICANT PREDICTORS OF NARRATIVE SCORE IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation	F R	P R	Percentage of Variance Accounted for
1	Synonym V40	28.3950	0.000	28.8582
2	Synonym V40, Proverb Rating	7.9552	0.0062	36.2124
3	Synonym V40, Proverb Rating, Function and Description V10	4.7139	0.0334	40.3477
Best Prediction Equation	$\hat{X}_{\text{Narrative}} = 5.424 + 0.0018X_{\text{Proverb Rating}} + 0.7391X_{\text{Function \& Description V10}}$ $+ 0.4137X_{\text{Synonym V40}}$			

The regression equation involving the Synonym V40 scores accounted for 40.35 percent of the variance of the criterion. The single best predictor of Narrative Scores is Synonym V40. However, whereas Synonym V40 accounted for 41.98 percent of the variance on the Van Wagenen Total Scale. Table XLIII indicates that Synonym V40 accounts for only 28.86 percent of the variance in the Narrative scores. The appearance of Function and Description as a positive significant predictor was unexpected.

Table XLIV, yields data with respect to the prediction of Central Thought subscores.

As shown in Table XLIV, the single best predictor of Central Thought subscores was Synonym V40 which accounted for 34.75 percent of the variation in the criterion. The "best fit" regression equation was found to involve Synonym V40 + Proverb General + WISC Verbal IQ variables as predictors. Adding Verbal IQ to the two best predictor variables produced a gain in efficiency in predicting reading for Central Thought of only 4.8 percent. Fifty-five percent of the variation in reading for central thought is unaccounted for and therefore attributable to other influences.

Table XLV, yields data with respect to the prediction of Simple Detail scores.

As is indicated by Table XLV, a large percentage of the variation in Simple Details was unaccounted for. Success in reading for details,

TABLE XLIV

SIGNIFICANT PREDICTORS OF CENTRAL THOUGHT SUBSCORE IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation	F R	P R	Percentage of Variance Accounted for
1	Synonym V40	37.2723	0.000	34.7455
2	Synonym V40, Proverb General	6.3871	0.0137	40.2741
3	Synonym V40, Proverb General, WISC Verbal IQ	5.9649	0.0171	45.0908

Best Prediction Equation

$$\hat{X}_{\text{Central Thought}} = 4.223 + 0.0592X_{\text{WISC Verbal IQ}} + 0.5431X_{\text{Proverb General}} + 0.1327X_{\text{Synonym V40}}$$

TABLE LXV

SIGNIFICANT PREDICTORS OF SIMPLE DETAIL SCORES IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation	F R	P R	Percentage of Variance Accounted for
1	Synonym V40	16.8187	0.000	19.3722
2	Synonym V40 Proverb - Literal	5.4189	0.0228	25.2433

Best Prediction Equation

$$\hat{X}_{\text{Simple Details}} = 16.194 - 0.2973X_{\text{Proverb Literal}} + 0.1389X_{\text{Synonym V40}}$$

as measured in this study, would appear to be dependent on factors over and above the language measures employed in this investigation.

Table XLVI, lists the variables that contributed to the prediction of Related Ideas subscores in the order that they were entered into the regression equation. The predicted scores accounted for 42.64 percent of the variance of the criterion. Proverb Definition by itself accounted for 30.41 percent of the variability associated with the dependent variable. Adding WISC Verbal to the equation produced an increase of 7.6 percent in the percentage of variance accounted for.

Table XLVII, yields data with respect to prediction of Inference Scores.

Table XLVII indicates that only 38.29 percent of the variability in the Inference measure was related to variability in the language and IQ measures. This reading skill appears to be dependent on factors over and above the language and IQ measures tested in this study.

Table XLVIII reports data for the equation computed for Interpretation subscores. Only 26.91 percent of the variance of the criterion was accounted for by the predicted scores. Proverb General was the single best predictor of achievement on Interpretation. Adding WISC Full Scale to the equation produced an increase of 5.4 percent in the proportion of variability of the dependent variable which could be attributed to variability in the independent variables.

TABLE XLVI

SIGNIFICANT PREDICTORS OF RELATED IDEAS SCORE IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation	F R	P R	Percentage of Variance Accounted for
1	Proverb Definition	30.5969	0.000	30.415
2	Proverb Definition, WISC Verbal IQ	8.4277	0.0049	37.9894
3	Proverb Definition, WISC Verbal IQ Proverb Metaphorical	3.9621	0.0505	41.4036
4[a]	Proverb Definition, WISC Verbal IQ, Proverb Metaphorical,-Proverb Definition	1.6251	0.2066	40.0032
5	Proverb Definition, WISC Verbal IQ, Proverb Metaphorical,-Proverb Definition, Function (V10)	3.1206	0.0817	42.6358

Best Prediction Equation

$$\hat{X}_{\text{Related Ideas}} = 10.536 + 0.0505X_{\text{WISC Verbal}} + 0.4227X_{\text{Proverb Metaphorical}} - 0.1606X_{\text{Function (10)}}$$

[a] Proverb Definition deleted as a predictor in Step 4.

TABLE XLVII

SIGNIFICANT PREDICTORS OF INFERENCE SCORE IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation	F R	P R	Percentage of Variance Accounted for
1	Synonym V40	31.9785	0.000	31.3580
2	Synonym V40, WAT Noun-Noun	3.4338	0.0681	34.6121
3	Synonym V40, WAT, Noun-Noun Paradigmatic Response	4.0575	0.0479	38.2941
Best Prediction Equation	$\hat{X}_{Inference} = 13.320 + 0.2092X_{Noun\text{-}Noun} - 0.0962X_{Paradigmatic\ Response} + 0.2391X_{Synonym\ V40}$			

TABLE XLVIII

SIGNIFICANT PREDICTORS OF INTERPRETATION IN THE ORDER ENTERED DURING STEPWISE REGRESSION ANALYSIS

Step n	Predictors Included in Regression Equation	F R	P R	Percentage of Variance Accounted for
1	Proverb General	14.9101	0.0002	17.5599
2	Proverb General, WISC Full Scale IQ	4.7988	0.0318	22.9207
3	Proverb General, WISC Full Scale, WAT Verb-Verb	3.7100	0.0582	26.9085
Best Prediction Equation	$\hat{X}_{\text{Interpretation}} = 7.619 + 0.0365X_{\text{WISC Full Scale IQ}} + 0.1620X_{\text{WAT Verb-Verb}} + 0.5273X_{\text{Proverb General}}$			

Summary

A stepwise regression analysis was carried out in order to assess the relative importance of language and inteiligence variables in predicting reading comprehension.

The findings for the analysis indicate that a combination of language and IQ variables is effective in predicting scores only for specific aspects of reading comprehension. Synonym V40 predicted reading achievement consistently well when compared with the other variables. In six of the equations this measure ranked first or second in its relative contribution to the equation.

Synonym V40 is characterized by definitions in terms of some essential characteristics of the referent, e.g., bicycle: "a two-wheeled vehicle which you 'peddle.'" and may be interpreted in terms of an abstract symbolic attitude. Proverb Definition appeared as another significant predictor of reading performance. Proverb Definition represents task orientation in a proverb test and is characterized by a response designed to say what the proverb means. Proverb General, which appeared in three equations, represents interpretation of a proverb in the terms, "Given a situation of Type A, then event A ensues."

For certain subscales of the Van Wagenen, e.g., Simple Details, as much as 74 percent of the variation was unaccounted for. IQ variables were included in the optimum set of variables in four out of eight multiple

regression equations. In no case was a WISC IQ score the "best" single predictor of reading achievement. The gain in efficiency in predicting reading achievement scores as a result of adding IQ measures ranged from 3 to 7.6 percent.

IV. FACTOR ANALYSIS OF THE VARIABLE AREAS

Factor analysis was employed to explore the variable areas and to determine the nature of the underlying factor structure. Gardner et al. (1968) have described a factor as a dimension of individual differences on which each individual in a study can be placed (p. 35). The raw data for all the variables were subjected to a principal components analysis and a subsequent orthogonal rotation to the varimax criterion.

Thirteen factors were used to obtain stable communality estimates. The rotated factor matrices and the communalities associated with each factor appear in Table LXXIV, Appendix G.

The thirteen rotated factors accounted for 76.52 percent of the total variance.

A primary purpose of the analysis was to determine whether common variance existed among reading, language and particular cognitive styles. The factor-analysis yielded several well-defined factors. Tables XLIX through LXI provide for thirteen factors those measures with Varimax

rotated factor coefficients equal to or greater than .30. Scores are listed and suggested interpretations for these factors are presented in Table XLIX.

TABLE XLIX

FACTOR I - MATURATION

Test	Score	Loading[a]
51	Proverb Definition	86
44	Proverb Rating	86
45	Proverb Other	-85
50	Proverb Literal	-81
48	Proverb Metaphorical	77
47	Proverb Concrete	-75
42	Proverb Correct	67
46	Proverb General	65
3	VW Related Ideas	35
20	Total Reading	34
60	Function V40	-33
21	Narrative Test	33
59	Synonym V40	32
14	WISC Vocabulary	31

[a]Decimal points omitted

This first factor extracted accounted for 13.46 percent of the common variance. All but one measure of the Proverb responses had a high loading on this factor. Indices of the ability to interpret a proverb at an abstract level loaded positively on the factor while indices of concrete responses loaded negatively. Children with high factor scores

scores understood the task in the Proverb test as one of definition and interpreted the proverbs as general statements. Factor I may be tentatively interpreted in terms of a maturation factor. French (1951, p. 3) p points out that in some analyses with children there appears to be a factor thought to be that of maturation. Tests having loadings on this factor are those which would ordinarily have loadings on such factors as Verbal Comprehension and Number but not on such factors as Perceptual Speed or Rote Memory. Proverb tests have had a high loading on the factor, Verbal Comprehension, identified for adult samples.

Factor II accounted for 13.20 percent of the common variance. The factor may be interpreted as a verbal factor. WISC Verbal loads .829 on this factor while WISC Vocabulary loads .822. The clustering of subtest scores for the WISC is comparable to that extracted by Gardner and Moriarty (1968) in a factor analysis of the WISC scores of sixty children. Most factor analytic studies of the WISC (for example Cohen, 1959) report a factor, Verbal Comprehension, most often defined by the Vocabulary, Information, Comprehension, and Similarities subtests. Goodenough and Karp (1961) in two factor analyses, extracted factors identified as the Verbal Comprehension factor. In their interpretation of WISC factors, Gardner and Moriarty (1968) noted that their Factor I, Verbal Comprehension, included features of Cohen's (1959) Factor II, Verbal Comprehension. Similar findings are noted for the present analysis, i.e., loadings for the

WISC subtests Picture Completion and Comprehension appear in this factor. In his study of ... Cohen (1959) suggested that the Verbal Comprehension fa factor "seems to reflect that aspect of verbally retained knowledge impressed by formal education" (p. 286), while Verbal Comprehension II "reflexts the application of judgments to situations following some implicit verbal manipulation" (p. 288). The difference between the two factors is not stressed by Cohen.

TABLE L

FACTOR II - VERBAL COMPREHENSION

Test	Score	Loading
8	WISC Verbal IQ	83
14	WISC Vocabulary	82
64	Error V40	-78
11	WISC Comprehension	71
7	WISC Full Scale IQ	70
65	Omission V40	-70
13	WISC Similarities	60
10	WISC Information	55
59	Synonym V40	54
12	WISC Arithmetic	51
1	VW Central Thought	45
15	WISC Picture Completion	44
29	OST Functional Response	-36
20	VW and Narrative	33
9	WISC Performance IQ	33
6	VW Total Score	31
53	Synonym V10	30

The significant loadings on Factor III were for measures of Word Association. The factor accounts for 10.96 percent of the common variance.

TABLE LI

FACTOR III - VERBAL RELATIONS

Test	Score	Loading
35	WAT Form Class	95
36	WAT Syntagmatic Response	-90
37	WAT Paradigmatic Response	90
33	WAT Adjective-Adjective	81
34	WAT Verb-Verb	78
32	WAT Noun-Noun	77
39	WAT Adjective-Antonym	70
38	WAT Noun-Coordinate Noun	58
58	Error V10	30

Factor III appears to be a grammatical factor. Only negligible loadings were obtained for the two semantic categories, Supraordinate Noun and Whole-Part. Factor III seems to reflect a syntagmatic-paradigmatic continuum in the response processes involved in the free association tests. Of interest are the minimal loadings for the three categories of vocabulary definitions-synonym, function and description which offer some confirmation for the suggestion that word association and definition elicit "alternative unrelated associative hierarchies" Shepard (1970, p. 412).

Factor IV, is characterized by reading variables and may be interpreted as a reading factor.

TABLE LII

FACTOR IV - READING

Test	Score	Loading
6	VW Total Score	86
	VW and Narrative	79
4	VW Inferences	76
5	VW Interpretation	75
2	VW Simple Details	73
3	VW Related Ideas	60
1	VW Central Thought	50
21	Narrative	45
46	Proverb General	40
22	Embedded Figures Test	-36
43	Proverb Omit	-33
59	Synonym V40	32

All the reading scores loaded Factor IV, a factor which accounts for 10.81 percent of the common variance in the test battery. The primary loading belongs to the Van Wagenen Total Score. Proverb General, which loads .395 on this factor, typically involves responses in terms of, "Given a situation of type A, then event A ensues" (Richardson and Church, 1959, p. 172) and may reflect the "abstract attitude" described in the literature (e.g., Gorham, 1956). High factor scores in reading are associated with a tendency toward field independence as indicated by the negative loading for the Embedded Figures Test. The link between reading and field-independence corresponds to findings reported by Iscoe and Carden (1961), and suggests that field dependence-independence may be related to verbal

ability as measured in tests of reading.

Factor V which accounts for 8.99 percent of the common variance is distinguished by the positive loadings for definitions in the synonym category and negative loadings for definitions in the functional category. The individual response category, Description, did not load on this factor, suggesting a basic synonym-function dimension. Synonym

TABLE LIII

FACTOR V - ABSTRACT WORD MEANING

Test	Score	Loading
57	Total Function-Description V10	-85
53	Synonym V10	84
63	Total Function-Description V40	-79
54	Function V10	-72
60	Function V40	-68
59	Synonym V40	65
67	Clang Association V40	-39
14	WISC Vocabulary	31

definitions, which typically involve responses of the type: sword--"a weapon, donkey--"an animal with long ears," represent an abstract, conceptual attitude toward words. Functional responses, which include answers of the type, sword--"you fight with it," donkey--"you ride it," suggest discrimination of objects through use. The loadings on this factor may be interpreted as representing a qualitative dimension in definition style.

Factor VI is comparable to the conceptual differentiation factor reported by Gardner and Moriarty (1968) in a study conducted with pre-adolescents. A conceptual differentiation factor has also been reported in studies with adults (e.g., Gardner and Schoen, 1962). The criterion of

TABLE LIV

FACTOR VI - CONCEPTUAL DIFFERENTIATION

Test	Score	Loading
26	OST Average Number of Objects per Group	-90
23	OST Number of Groups of two or more Objects	87
25	OST Number of Groups	88
24	OST Number of Single Objects	54
31	OST Percentage Abstract and Functional Responses	49
30	OST Percentage Concrete Responses	-49
29	OST Percentage Functional Responses	43
27	OST Level of Abstraction	35

conceptual differentiation is the total-number-of-groups score. Gardner and Moriarty (1968) have stated:

> Free categorizing tasks ... seem to evoke the operation of a cognitive control determining the degree of differentiation imposed upon arrays of stimuli but whose

> operation is not restricted to performance in such tasks (p. 77).

The role of level of abstraction as a determinant of response in the free categorizing test is somewhat obscure among children. In their study with adults Gardner and Sloane (1962) indicated that consistencies in conceptual differentiation are largely independent of level of abstraction at which the person chooses to function. However, Level of Abstraction loaded .37 on the conceptual differentiation factor extracted by Gardner and Moriarty (1968), in their analysis of children's performances. Gardner and Moriarty (1968) observed:

> The positive loading for preferred level of abstraction in the Object Sorting Test was not anticipated. In the case of normal adults (Gardner and Schoen, 1962), preferred level of abstraction and conceptual differentiation are clearly independent. ... The fact that preferred level of abstraction loads on the preadolescents' conceptual differentiation factor could be understood in either or both of two ways: (a) only one preferred level of abstraction score was included in the present study--in contrast to the adult study of differentiation and abstraction (Gardner and Schoen, 1962), in which conceptual differentiation and preferred level of abstraction were separate factors--so that a preferred level of abstraction common factor could not emerge; and (b) The Object Sorting Test is more difficult for preadolescents than adults ... so that preferred levels of abstraction is a more important determinant of the number of groups formed in the case of preadolescents (p. 112).

The loading of .35 for level of abstraction in the present study compares with the loading of .37 reported by Gardner and Moriarty (1968) on a Conceptual Differentiation factor. This factor accounted for 7.36 of the

common variance. Loadings for the language scores on this factor were negligible.

Factor VII is a closure-factor defined by high loadings for Block Design and Object Assembly. The cluster of WISC scores is comparable to the cluster described by Cohen (1959) on the factor Perceptual Organization. Cohen (1959) found that Picture Completion loaded this factor at ages ten years, six months and thirteen years, six months. Gardner and

TABLE LV

FACTOR VII - CLOSURE

Test	Score	Loading
18	WISC Object Assembly	81
9	WISC Performance	81
17	WISC Block Design	78
22	Embedded Figures	-68
7	WISC Full Scale	61
15	WISC Picture Completion	37
11	WISC Comprehension	32

Moriarty (1968) extracted a comparable cluster of WISC subtests in an analysis of WISC scores for preadolescents aged nine to thirteen years. Gardner and Moriarty (1968) report a loading of .32 for the WISC Comprehension subtest. A loading of .32 was obtained for WISC Comprehension in the present study. The loading for the Embedded Figures Test on this factor is consistent with findings reported by Goodenough and Karp (1961).

In two factor analyses Goodenough and Karp found that the Embedded Figures Test had its highest loadings on factors in which three WISC subtests, Block Design, Picture Completion, and Object Assembly were also highly loaded. Goodenough and Karp (1961) report factor loadings of .50 and .69 for the Embedded Figures Test. Witkin et al. (1962) and Goodenough and Karp (1961) suggest that the relationship between IQ scores and field dependence-independence measures may be a function of a common requirement for overcoming embedded contexts. Goodenough and Karp (1961) concluded from their studies:

> The hypothesis that there is a factor, common to intellectual and perceptual tests and involving the capacity to overcome an embedding context, receives some support from the results of these studies.... These results tend to support the Witkin Hypothesis that relationships obtained in many studies between tests of field dependence and standard tests of intelligence stem, at least in part, from common requirements shared by measures of field dependence and of certain kinds of intellectual abilities (p. 245).

The relationships demonstrated in the present study between IQ scores and Field dependence-independence are factorially similar to those described by Goodenough and Karp (1961).

Factor VIII appears to be measuring preferred level of abstraction and accounts for 3.48 percent of the common variance. In their study of differentiation and abstraction conducted with an adult sample, Gardner and Schoen (1962) identified conceptual differentiation and preferred level

of abstraction as separate factors. The results for Factors VII and VIII in the present study indicate that while conceptual differentiation and level of abstraction are independent factors, preferred level of abstraction also loads positively on the conceptual differentiation factor obtained for children. The loading on Factor VIII for Proverb Omits was unexpected. The absence of significant loadings for other language measures suggests that level of abstraction, as measured in this study, in unrelated to level of abstraction in language as indicated by the rating procedures employed in this study.

TABLE LVI

FACTOR VIII - LEVEL OF ABSTRACTION

Test	Score	Loading
27	OST Level of Abstraction	81
28	OST Percentage Conceptual Responses	75
31	OST Percentage Conceptual and Functional Responses	71
30	OST Percentage Concrete Responses	-71
43	Proverb Omits	48
12	WISC Arithmetic	42

Although there does not appear to be a clear explanation or interpretation of the following factors, they are being reported because of the high loadings of particular variables on them.

Factor IX, which accounts for 5.46 percent of the common variance, suggests a factor related to qualitative level of response in vocabulary definitions. Function and Description responses are typically those of the following type: knife--"it's sharp and it is used to cut." This type of definition contains characteristics of both the Function and the Description response.

TABLE LVII

FACTOR IX

Test	Score	Loading
56	Function and Description V10	92
62	Function and Description V40	90
54	Function V10	-46
60	Function V40	-36
68	Misinterpretation V40	34

The loadings for Factor X suggest that the Description definition may represent an essentially independent mode of response. The Description definition is typically of the type: spade--"like a heart with a knob," and suggests strong ties to the concrete, perceptible attributes of the referent. The factor is tentatively identified as a "concrete word meaning" factor. This factor accounts for 4.33 percent of the common variance.

Factor XI, accounts for 4.20 percent of the common variance. No interpretation is offered for the factor. The loading for the WISC subtest Picture Completion may be examined in terms of Cohen's (1959) analysis

TABLE LVIII

FACTOR X

Test	Score	Loading
55	Description V10	86
61	Description V40	76
68	Misinterpretation V40	-43
60	Function V40	-36

of WISC subscores. Cohen found that Picture Completion loaded Factor E: a factor for which no psychological interpretation was given. Cohen stated of Factor E: "It is not an important factor in terms of the amount of variance it accounts for in any of the children or adult groups. But it is 'real' in the sense that its consistent appearance in both studies precludes its attribution to sampling fluctuations in the subtest intercorrelations" (p. 289).

TABLE LIX

FACTOR XI

Test	Score	Loading
40	WAT Noun-Supraordinate Nouns	-65
16	WISC Picture Arrangement	61
39	WAT Adjective-Antonym	49
29	OST Percentage Functional Response	39
15	WISC Picture Completion	32
9	WISC Performance	31

Factor XII, accounts for 3.94 percent of the common variance. It is characterized by proverb definitions which are basically metaphorical but which contain certain literal elements.

TABLE LX

FACTOR XII

Test	Score	Loadings
49	Proverbs Mixed	71
66	Wrong Definition V40	-53
24	OST: Number of Single Objects	41
68	Mininterpretation V40	-35
48	Proverb Metaphorical	-32
38	WAT Noun-Coordinate	31
65	Omissions V40	31

The basis for the loadings in Factor XIII, which accounts for 3.61 percent of the common variance, are not clear.

TABLE LXI

FACTOR XIII

Test	Score	Loadings
41	WAT Whole-Part	69
19	WISC Coding	51
43	Proverb Omit	-38
67	Clang Association V40	34
15	WISC Picture Completion	-31
12	WISC Arithmetic	31

Summary

The factor analysis produced several clearly-defined factors. A cognitive style factor, conceptual differentiation, emerged which is comparable to conceptual differentiation factor described by Gardner and Moriarty (1968). The Level of Abstraction factor is similar to the Level of Abstraction factor described by Gardner and Schoen (1962). The loading of the Embedded Figures Test on a factor described as Closure, is comparable to the loading obtained by Goodenough and Karp (1961). The loading of the Embedded Figures Test on a factor defined by reading tests indicate that this measure of cognitive style and reading share a common variance. The loading for the Embedded Figures Test, while low offers support to the hypothesis of a relationship between reading and cognitive style.

The battery of tests was apparently measuring several aspects of language. Proverbs, Word Association, and Synonyms involve independent aspects of response.

Neither an abstract nor a concrete language factor emerged. However, Synonym V40 loaded a factor identified as "Abstract Word Meaning." Description loaded a factor tentatively identified as "concrete word meaning." Although the scoring guides for the language measures were felt to be based on a common principle of concreteness and abstractness, different dimensions of the concept may have been assessed.

V. SUMMARY

The findings relating to (1) the intercorrelations among the language, reading, and cognitive style variables, (2) the language and IQ variables as predictors of reading achievement, and (3) the analysis of the underlying factor structure were presented in this chapter. A review of the three groups of findings is presented below. Table LXII provides a summary of findings related to the questions posed for the study.

An analysis of the quality of responses on the language measures, indicated unity of verbal habit for the proverb and vocabulary responses. However, quality of response on a Word Association Test was not related to quality of response on proverb and vocabulary measures.

Qualitative level of response on proverb and vocabulary measures was significantly related to reading comprehension. Significant positive correlations were obtained between reading comprehension and conceptual responses. Significant negative correlations were obtained between reading and functional responses. A random relation between reading and description responses was indicated.

A combination of language and IQ variables was significant for predicting scores for specific aspects of reading comprehension. Synonym V40 predicted reading achievement consistently well. In no case was a WISC IQ score the "best" single predictor of reading achievement.

TABLE LXII

A VERBAL SUMMARY OF THE FINDINGS RELATED TO THE MAJOR QUESTIONS

Major Questions	Correlation Analysis	Stepwise Multiple Regression Analysis	Factor Analysis
1. To what extent is unity of verbal habit demonstrated in measures of language performance when these measures are analyzed in terms of language differentiation?	There is a significant relation between the production of abstract responses on the Vocabulary Test and the production of abstract responses on the Proverbs Test. The production of Function responses on the Vocabulary Test is significantly related to the production of Literal and Concrete responses on the Proverbs Test. Scores on a Word Association Test show limited association with scores on a Vocabulary Test. Correlations between Proverb scores and Word Association scores are not significant at the .01 level but some consistent trends are evident at the .05 level. E.g., Proverb Other showed a low positive correlation with WAT Syntagmatic response.		Proverb scores obtained high loadings on a Factor which was interpreted as a Maturation Factor. Synonym V40 obtained a low positive loading on this factor. Function V40 obtained a low negative loading. Synonym V40 loaded a factor interpreted as Abstract Word Meaning, Synonym responses obtained a positive loading while Function and Function-Description responses obtained negative loadings on the factor. Word Association scores obtained a loading on a factor interpreted as Verbal Relations. Synonym V40 and abstract scores in the Proverbs test received negligible loadings on this factor. Combined Function and Description responses loaded a factor

TABLE LXII (continued)

Major Questions	Correlation Analysis	Stepwise Multiple Regression Analysis	Factor Analysis
			which suggested interpretation in terms of the vocabulary response. Description responses loaded a factor which was tentatively identified as a "concrete word meaning" factor.
2. Are the qualitative patterns of responses to selected measures of language differentiation significantly related to performance on measures of reading comprehension?	The production of Synonym V40 responses shows a significant correlation with all reading scores and subscores. The production of Function V40 responses shows a significant negative correlation with all reading scores except Simple Details and Interpretation. No significant correlations (.01) were found for Reading and Word Association. WAT Paradigmatic Scores show a positive correlation with reading while WAT Syntagmatic scores show a negative correlation with reading.	Synonym V40 predicts reading achievement well when compared with IQ variables and other language variables. Proverb Definition and Proverb-General have a degree of effectiveness in predicting reading performance.	Proverb General and Synonym V40 loaded a factor interpreted as a Reading factor.

TABLE LXII (continued)

Major Questions	Correlation Analysis	Stepwise Multiple Regression Analysis	Factor Analysis
	The production of abstract response on a Proverbs Test shows a significant positive association with reading performance. The production of concrete responses on a Proverbs Test shows a significant negative correlation with reading.		
3. What are the relations between individual differences in cognitive style and variations in performance in language and reading?	Field independence is associated with the production of abstract word definitions and with the production of abstract responses on Proverbs Test. Relations between Field Independence and performance on a Word Association Test tend to be random. Conceptual differentiation and language show no significant relations. Field independence shows a significant correlation with reading performance. Conceptual differentiation in categorizing tasks is unrelated to reading.		Field Dependence loaded -.36 on a factor interpreted as a Reading factor. The loading for Conceptual Differentiation on the Reading factor was negligible.

Performance on measures of reading comprehension was associated with the cognitive style, field independence. No association was obtained between reading comprehension and the cognitive style, conceptual differentiation.

The cognitive styles described as field dependence-independence and conceptual differentiation were not related.

Significant correlations were obtained between field independence and conceptual responses on a proverbs test and a vocabulary test. Correlations between field dependence and concrete responses were positive but did not reach significance. Language differentiation as indicated by the qualitative ratings on proverb and vocabulary tests was not associated with the cognitive style, conceptual differentiation.

Preferred level of abstraction scores on an Object Sorting Test were unrelated to the qualitative ratings obtained for measures of proverbs and vocabulary. When preferred level of abstraction was represented by Percentage Conceptual, Percentage Functional, and Percentage Concrete scores, correlations between the Percentage Conceptual scores and reading measures reached significance. Abstract responses on proverb and vocabulary measures were also significantly correlated with Percentage Conceptual scores on an Object Sorting Test. Correlations between Percentage Functional Scores on an Object Sorting Test and concrete responses on measures of proverbs and vocabulary did not reach significance.

The factor analysis produced several clearly-defined factors. Thirteen factors were used to obtain stable communality estimates. Eight of these factors were identified as follows: Maturation, Verbal Comprehension, Verbal Relations, Reading, Abstract Word Meaning, Conceptual Differentiation, Closure, and Level of Abstraction. A factor which could be identified as an abstraction factor did not emerge. However, conceptual responses on a vocabulary measure obtained a high loading on the factor identified as Abstract Word Meaning. A factor defined by concrete responses suggested a concrete response factor related to vocabulary.

CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

I. SUMMARY

The specific concern of the present study was the exploration of the relations among reading, language, and cognitive style. Seventy-two grade six students participated in the investigation on which the present report is based. The sample included 34 girls and 38 boys.

The instruments used in the study included measures of reading comprehension and language differentiation, two tests of cognitive style, a measure of spontaneous flexibility and an individual test of intelligence. Product moment correlations were computed for all variables. In addition, the language and intelligence variables which made significant contributions to the efficiency of predicting reading performance scores were determined through stepwise regression analysis. A factorial analysis process was employed to reduce the data to major dimensions.

II. LIMITATIONS

Interpretation of the presented data, the conclusions and inferences, were made within the limitations imposed by certain factors.

1. Although the sample was chosen randomly, the subjects tended to be of slightly higher intelligence than would normally be expected.

2. Questions of competence and performance arise in an analysis of the child's verbal responses to the language measures, and his verbal explanations of the conceptual groupings. It is possible that the child's capacities were underestimated because he lacked words for a super-ordinate explanation.

3. Measures that use object sorting are only partially satisfactory as indicators of differentiation. Because the number of categories used and the number of objects in each category are placed in opposition, only a limited number of dimensions can emerge.

III. CONCLUSIONS

Several conclusions appear to be warranted within the limitations of the study. These conclusions are discussed within the context of the rationale and the particular analyses employed in the study.

A basic concept employed in the study was that of differentiation, a concept which has been particularly popular in relation to the problem of the developmental aspects of cognitive structure, and which implies the refinement of structures into progressively more specific units (Bieri, 1966, p. 14).

Another concept which was employed was that of the individual as an active and structuring organism or as in Blake's (1951, p. 9) description, "The system is, in a word, an agency of interaction, organized to make probable its own spatial-temporal-social continuum."

Interactionist positions on the acquisition and use of language were considered. As described by Houston (1971, p. 268), to the interactionist, "language is both a form of behavior and an internalized system." As a form of behavior, "language provides an observable key to the child's concepts of reality," and as an internalized system, it "provides the means by which the child can manipulate objects, form concepts of causality and logical relations, and think about his world."

Comprehension was used as the criterial behavior of reading in the study and the view of reading placed it within a cognitive development, language-based context.

The individual's characteristic ways of thinking, perceiving, and ordering his environment have been defined as cognitive styles. The cognitive styles conceptualized as (a) field dependence-independence, and (b) conceptual differentiation, were investigated in the study. Field dependence-independence is a cognitive style relevant to analytic ability. Developed analytic ability, or field independence refers to self-consistent behavior involving an articulated way of experiencing the world, a

differentiated self, reflected particularly in an articulated body concept and a developed sense of separate identity (Witkin, 1962). The cognitive style, conceptual differentiation refers to the degree of differentiation imposed upon arrays of stimuli under the requirement to categorize them and is assumed to be an enduring characteristic of an individual's concept formation. The foregoing summarizes the conceptual framework which provided some direction to the investigation. The following section relates to the specific findings of the study.

Language was examined from the point of view of developmental progression. Those language measures were chosen which show consistent developmental changes and which allow the subject to give direct expression of his language maturity. Scoring features which took account of the qualitative features of the response were employed. A hierarchical system of concepts was assumed. Mature responses were defined in terms of synonym responses on the vocabulary measure, by metaphorical definition, and general responses on the proverbs test, and by paradigmatic responses and high total form class scores on the test of word association. A lesser degree of language differentiation was indicated by function and description responses on the vocabulary test, by literal and concrete interpretations of the proverbs test and by syntagmatic responses on the word association test. A high degree of verbal unity was found for the vocabulary and proverb

tests. Conceptual responses on the one were significantly correlated with conceptual responses on the other. Concrete responses on the one correlated significantly with concrete responses on the other. This relationship did not hold for the word association test although trends were consistent, i.e., literal responses on the proverbs test correlated negatively with paradigmatic (more mature) responses on the word association test.

Conceptual responses on the vocabulary and proverb measures were significantly correlated with reading comprehension. This association was confirmed by the stepwise regression analysis procedure which indicated that Synonym V40 in particular, was a significant predictor of performance on measures of reading comprehension.

Two measures of cognitive style were employed in the study. Significant, but low, correlations were obtained for the Embedded Figures Test, a measure of field dependence-independence, and measures of reading comprehension. An Object Sorting Test was used as the criterion measure of the second cognitive style, conceptual differentiation. The cognitive style, conceptual differentiation showed no relation to reading and appears to measure a different aspect of differentiation from the language measures and the Embedded Figures Test. The Embedded Figures Test and the Object Sorting Test measured independent cognitive styles as indicated by the factoral analysis procedure. A relationship between field independence and

reading comprehension was indicated in the correlational analysis and by the loading for the Embedded Figure Test on the reading factor. The relationship is low, but significant, and in terms of the nature of the variables may be considered to be an important one.

Findings for the Object Sorting Test supported those reported in the literature by Gardner and Moriarty (1968). Whereas for adult samples, Gardner and Schoen (1962) found no association between level of abstraction on an Object Sorting Test and the number of groups derived, findings for children (Gardner and Moriarty, 1968) indicated that level of abstraction may be related to the number of groups sorted. In the present study, level of abstraction was also related to the number of groups sorted. The findings are interpreted to indicate that for children, preferred level of abstraction may be a significant aspect of object-sorting behavior.

Patterns which emerged for the reading tests suggested that the Narrative Test resembled the Related Ideas subscale of the Van Wagnen Scale. Both the Narrative Test and Related Ideas loaded on the Maturation factor defined by the Proverbs scores. The effectiveness of the language measures as predictors of reading did not hold across all the reading subscales. This finding suggests the merit of analyzing reading performance in terms of specific subskills.

Two cognitive styles were identified in the study, one of which has implications for reading and language.

The problems of identifying the factors which are related to success in reading comprehension are not new, and investigations have been concerned with such predictive variables as visual characteristics, auditory discrimination skills and various other abilities. The findings of the stepwise analysis for the present study could be interpreted as further evidence to long held conclusions that learning to read is a complex task. Although two of the language measures, as well as the intelligence test were found to be significantly related to reading achievement, a combination of these measures left a considerable amount of variability in the measures of reading comprehension which could not be explained on the basis of variability in the language and IQ measures. Reading comprehension is dependent upon factors over and above the abilities measured in this investigation.

IV. IMPLICATIONS

The findings presented have certain practical applications.

The results of a study such as this may prove useful to the classroom teacher who is concerned with the child's total readiness for reading. Of interest to the present research, both because of an emphasis on fluid ability and its findings concerning vocabulary, is a recent report by Newman (1972) on sixth grade reading outcomes. The question of analytic "fluid ability in contrast to trained or crystallized" ability is currently

receiving attention in the reading literature. Cattell's (1968) theory of intelligence holds that there are two general intelligence factors, crystallized general ability and fluid general ability:

> Crystallized ability ... loads more highly those cognitive performances in which certain initial intelligent judgments have become crystallized as habits .... Fluid general ability, on the other hand, shows more in tests requiring adaptations to entirely new situations, where crystallized skills are of no advantage because they do not apply to the particular data (p. 19) .

Cronbach (1970, p. 240) points out that the work of Witkin and his associates has shed considerable light on the distinction between fluid and crystallized ability. Cronbach examines the personality interpretation and ability interpretation of the Embedded Figures Test and classifies EFT as a measure of fluid ability. Newman (1972) reported a follow-up study at the sixth-grade level of the effects of first-grade reading treatments on pupils who were likely underachievers. In two of three canonical correlations conducted in the study, strong two-rank factors appeared. Newman noted:

> In each case the first was a g-factor and the second had a sex linkage in favor of boys. Also, in both cases this second factor has relatively strong loading on vocabulary-type subtests indicating a "growth" category as opposed to such girl-favored "worker" categories as Word Study Skills and Spelling (p. 504) .

The second factor also suggested "a more exploratory vocabulary-category

strength." The findings were interpreted by Newman as follows:

> The differentiation between the first and second factors may lend support to Cattell's theory of crystallized versus fluid intelligence. The first canonical factor, which might represent crystallized intelligence or "good-worker category," appears in the sixth-grade analysis to favor the girls. On the other hand, the second factor, favoring a fluid intellect, suggests that boys more than girls absorb and react spontaneously or creatively, to the world around them, but do not respond as much with the teacher-pleasing behavior that, for girls, often results in high scores in such subtests as Spelling and Work Study Skills (p. 503).

The findings regarding the boys' strength in some areas of vocabulary mastery suggested that boys should not be considered verbally immature or inferior to girls in handling vocabulary .... "Rather considerable advantage might accrue to boys in their intellectual growth, if cumulative vocabulary development were dealt with as the strength is is" (p. 504). The importance for reading of the vocabulary response termed synonym in the present study, suggests that systematic and carefully planned learning experiences to develop vocabulary skills be provided in the elementary grades.

The findings of a relation between reading and field-independence suggest that the full model of reading should incorporate cognitive style.

The fact that elementary school children can be characterized by individual cognitive styles bears upon the problem of individual variation

in the classroom. Rohwer (1970) has referred to the necessity of determining the "presenting status" of students, a problem related to the identification and classification of individual differences. Schools may ask which individual differences are amenable to modification, and which will have to be provided for by different forms of educational practice (Rowher, 1968, p. 1444). Whether the cognitive style of field dependence-independence is open to influence, remains a question. Cattell has suggested that fluid abilities are more inherently fixed, and are about ten percent amenable to change. If performance on an Embedded Figures Test does indeed reflect fluid ability the implications for education suggest different forms of practice.

Witkin et al. (1962) suggested the development of tasks which would permit a specific evaluation of extent of articulation in the medium of language and postulated a relation between such indices of language differentiation and mode of field approach. Such a relationship was obtained in the present study for responses on vocabulary and proverb measures. The growth of skills in word association appears to follow a different path. The foregoing measures of language differentiation are unrelated to conceptual differentiation.

The findings suggest a relationship between language differentiation and psychological differentiation when language measures are defined in terms of developmental characteristics.

V. SUGGESTIONS FOR FURTHER RESEARCH

This exploratory study has provided some answers to the questions posed in developing the hypotheses. However, additional research needs have been identified which relate to the components of language significant for reading, to an analysis of the reading process, and to further identification of individual consistencies in the cognitive behavior of children. Specific recommendations for further investigation include the following:

1. A comprehensive analysis of reading is suggested in order to determine the factors which contribute to reading at the upper elementary level. This recommendation parallels that made in current reported research on reading. Lohnes (1972) in a report on a reanalysis of second-grade data of the United States Office of Education (U.S.O.E.) Cooperative Reading Studies found that the best single explanatory principle for observed variance in reading skills was variance in general intelligence. However, noting that intelligence is not the sole trait involved in complex reading, Lohnes and Gray (1972) state: "One certainty is that reading research will have to be multivariate in measurement, in data

analysis, and indeed in philosophy" (p. 476).

2. The demonstrated merits of the qualitative analysis of a subject's verbal responses suggests the need for suitably constructed tests which will allow for the expression of developmental change in vocabulary in terms of qualitative levels.

3. Inasmuch as the essentials of good reading instruction involve the interaction between the learner and the teacher, it is suggested that the component of cognitive style be included as a variable in analyses of classroom interaction.

4. An exploratory study of cognitive styles may be carried out with retarded readers in order to determine whether particular styles are factors which inhibit reading growth. Such studies should contribute to the development of cognitive profiles for retarded readers.

5. As cognitive styles may have implications only for particular aspects of reading, it is recommended that studies be conducted to determine the relation of cognitive styles to specific reading skills. The findings of such studies may have significance for both methods and the materials used in teaching reading.

6. Further investigations of the cognitive style, conceptual differentiation, may be carried out in order to determine the generality of the style for children. Studies similar to those used in determining the generality of the style with adults may be considered.

7. As patterns of cognitive styles, rather than individual style, may be significant for education, further studies may be done to determine the patterning of cognitive styles within individual children.

8. Cognitive style may be investigated in terms of the skills of the fluent reader.

9. As knowledge of cognitive structure implies that predictions can be made of the way in which the individual copes with the environment, research may be conducted to determine the predictive implications of individual cognitive styles and of patterns of styles for reading.

10. Analysis of style may be extended to analysis of verbal style.

11. Further research appears to be warranted to determine the relation of the verbal response on an Object Sorting Test and and other measures of language.

12. The area of word association appears to be one which merits further investigation. A suggested approach is that of analysis of word association clusters according to the procedures developed by Deese (1966).

13. Kolers (1970, p. 15) has suggested that the teaching of reading emphasize somewhat the clue-search and information-extracting characteristics of reading. Shouksmith (1970, p. 88) has emphasized that one of the most important research areas in thinking is concerned with establishing the nature of those factors which determine selectivity. However, as Butcher (1968, p. 74) has noted, very little consideration has been devoted to the psychological processes involved in attaining the correct answers on intelligence tests. An analysis of appropriate strategies and the detailed mental processes involved in reading may be directed to what Shouksmith has called the "dynamic, directional elements" or continued emphasis on the dynamics of thinking in reading.

14. Jones (1968) has suggested that perceptual units in language processing may be different at different stages in language learning. Units may also be different for different

contexts. Further research may be directed toward an examination of the meaningful units used by the reader, whether words, phrases, clauses, simple or complex sentences.

15. Conceptual systems theory may be employed in a study of reading comprehension (e.g., Schroder et al., 1967). A disposition toward a particular system may be explored in terms of performance on particular types of context, or in terms of specific reading skills such as making inferences.

16. Inasmuch as reading has been described as a process of "educated guessing," an analysis of the risk-taking dispositions of the child may be carried out as part of an analysis of reading performance.

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APPENDIXES

APPENDIX A

PROVERBS TEST

PROVERBS TEST

1. An ounce of prevention is worth a pound of cure.
2. Don't cross your bridges until you get to them.
3. Every cloud has a silver lining.
4. All that glitters is not gold.
5. Don't cry over spilt milk.
6. Where there's smoke there's fire.
7. You can't teach an old dog new tricks.

APPENDIX B

WORD ASSOCIATION TEST

WORD ASSOCIATION TEST

baby

red

kick

dog

chair

pretty

glass

throw

blanket

big

ear

rope

run

dirty

apple

spoon

write

draw

tall

clock

stove

soft

nose

walk

tree

eye

hot

sit

flower

mother

carry

milk

dark

moon

jump

car

sweet

talk

fire

fat

APPENDIX C

NARRATIVE TEST

THE AVENGER

At the edge of the island lay Ray of the Rainbows, the wild boy, and he was angry. He could feel the little waves of anger still rippling up and down his spine, for that was the way the anger took him, like the bristling of a dog's coat. Also, although he did not know it, anger made his eyes shine green in the darkness.

Spring was not far off; very soon the skies would be filled with the clarion notes of the wild geese and the crazy laughter of the loons; but now it was silent save for the intermittent surges of sound--silent with the tomb-like silence of the far-back woods. But the surges of sound were like the voices of a multitude of people very far away, each outburst starting in a scarcely-heard murmur, then growing, growing, till it reached its full volume, palpitating and evil, to face as it had begun, with indescribable melancholy in its cadence. And each outburst of sound was a little closer, a little louder, and as Ray listened his eyes shone a little brighter, for he had correctly judged that any hunted deer would run this way. That pack was in full cry of one!

Ray saw to it that there was nothing in his gear or his clothing which could hitch up in the thickets, for that was dangerous. His winter suit was like a coverall, fitting close to his skin--muskrat pelts, fur inwards, bound and braced with wolverine and wolf skin, and his feet

were shod in moosehide, laced to the knees. His hunting knife and his quiver were held tightly to his body, for Ray of the Rainbows was esentially a hunter, and he made his own clothes.

Tonight the boy considered himself fully-armed, which foretold ill for someone. In his right hand he held his usual bronze-tipped ash spear, in his left a two-foot metal tube, dull outside, but polished within like a well-kept rifle. To his belt was fixed a moosehide sheath containing a dozen polished steel darts, each a foot in length, and exactly fitting the tube.

That afternoon Ray had found four Whitetail deer lying on the ice in a sheltered bay not far from here. The wolves had pulled them down, but such is their squandering of game that they had left them untouched. It was a pathetic sight, pathetic to Ray who had known those deer. The little herd had evidently been surprised, and it was the fawns of last year, still dappled about the neck and not yet at full strength which had fallen. Ray could picture the whole scene as the wolves suddenly burst in among them, the older deer instantly bounding and whistling the alarm, the fawns just standing still and shuddering, unable to break from the nightmare spell of it. So they would just fall where the stood, with scarcely a bound to get away. Well, Ray had played with those fawns in the days of summer when the bluebirds flashed and the cicadas chirped in the thickets, and that was why he was angry. His friends had been killed by those who are the foes of all, and, so, an eye for an eye and a life for a life. Ray was prepared to gamble with his

own life tonight, and he was glad to hear the approaching wolves.

Facing him from the island was the lake margin, about two hundred yards off, though in the brilliant moonlight it hardly looked a stone's throw. The cliffs rose straight up for twenty feet or so, but a tall pine had fallen over the edge, and lay at a steep angle from the brow of the cliff down to the ice. An hour ago Ray had been busy with his axe, thinning the branches and removing the snow and ice from the upper bark. Now he was watching intently in that direction for he knew how quickly shadows may slide by in the moonlight. But it was not the wolves for which he was watching.

She came, not fifty yards from him, a Whitetail deer, running full out. He could see the breath from her nostrils, could see where it had condensed and caked into ice about her shoulders, for she had run far and fast. Her eyes were wide with fear, and although she ran all out she was making heavy weather of it, for she was not provided with spreading snowshoes like her big cousin, the caribou, and the ice crust was yielding to her dainty hooves.

Ray could see that she was trembling as she ran, and he would, if he could, have given her a message of good cheer, for the deer were his favourites. She had only to run now till she dropped, and that would not be far; then she would die, as the four in the quiet bay had died.

Die to satisfy her merciless enemies, fiends of the night, sinister, ghost-like, evil.

Ray's eyes shone green as he slid from his hiding place, hard on the heels of the deer. He was about to change places with her, and his courage did not waver, for he knew what few woodsmen know: that a timber wolf on the trail is little faster than a good human sprinter. It is their unending staying powers which count. He had faith in his own nimble feet and in the quickness of his hands to strike, so he slid across the frozen snow to the place where the hoof-marks of the bounding deer showed plainly in the moonlight. There he threw himself down, and lay like an exhausted deer on her trail, facing the way the wolves were coming. What a risk for a boy to take!

NARRATIVE TEST

Directions:

Today you are going to do a special reading exercise. It will show how well you can read and understand a story. The results will be useful only if you do your best. These are the steps to follow.

First read the story through completely. Then answer the question sheet. You may begin the questions as soon as you have read the story. You may read the story or any part of it as often as you need to.

Answers may be written in pen or pencil.

Is there anyone who does not know just what to do?

If, after you start, you find that you are not sure just what to do, raise your hand and ask for help. You may continue working until you complete the exercise.

Name _____ Boy ( ) Girl ( )

School _____ Date _____

PART I

Tell the story in your own words.

PART II
(continued)

7. Ray is said to be a wild boy. What does this mean exactly?

_____

_____

_____

8. What was Ray's plan? List the steps in the order in which they were being carried out.

_____

_____

_____

9. Why was Ray not afraid to meet the wolves?

_____

_____

10. What message of cheer could Ray have given the deer which passed his hiding place?

_____

_____

_____

11. According to the story what gives the timber wolf the advantage over the animal he is chasing?

_____

_____

_____

PART II

1. What would be another good title for the story?

_____

2. Who or what is meant by "someone" on page 2, line 2?

_____

3. What were the "surges of sound" that are described in the second paragraph?

_____

_____

_____

4. What was it which "foretold ill for someone"?

_____

5. Explain the sentence: "The boy considered himself fully armed."

_____

_____

_____

6. What were Ray's weapons? _____

_____

_____

_____

NARRATIVE--THE AVENGER

SCORE SHEET FOR FREELY WRITTEN RESPONSE

Pupil No. _____

PART I (12 points)

Total Score _____

	Rating Guide	Pupil Rating
1. Theme	Complete	_____ 4
	Almost equivalent	_____ 3
	Some measure of comparability	_____ 2
	Retains core of story but is fragmentary	_____ 1
	Has lost core of story	_____ 0
2. Translation	Retells story, adapts to own scheme in retelling	_____ 2
	Interprets only the obvious, barely achieving interpretation	_____ 1
	Direct reproduction of content of selection	_____ 0

NARRATIVE--THE AVENGER
(continued)

PART I (continued)

		Rating Guide	Pupil Rating
Quality and Structure of Reproduction			
3.	Explication of plot	Recognition of sequence, past, present, future	_____ 1
		No recognition of past action and implications	_____ 0
4.	Coherency	Coherent	_____ 1
		Incoherent	_____ 0
5.	Maintenance of basic organization	Response organized to show inter-relatedness of all ideas, both main ideas and detail. Good organization and insightful inclusion of detail. Has proportion, development, completeness.	_____ 4
		Response organized but not so complete as at level five. Shows the relationships among ideas and an understanding of details as modified and coloured by the context of the whole.	_____ 3
		Tends to be fragmentary. Some attempt to organize.	_____ 2
		The reproduction of a few details.	_____ 1
		No attempt to present ideas in unified pattern.	_____ 0
			Score

NARRATIVE -- THE AVENGER
(continued)

PART II (18 points)

	Question	Rating Guide	Pupil Rating
1.	Title	Most inclusive of main theme	_____ 2
		Suggesting main theme	_____ 1
		Having no relationship to main theme	_____ 0
	Recognition of Antecedent		
2.	Who or what is meant by "someone" on page 2, line 2?	Correct response	_____ 1
		Incorrect response	_____ 0
	Figurative Language		
3.	What were the "surges of sound" that are described in the second paragraph?	Correct response	_____ 1
		Incorrect response	_____ 0
	Locating Subject		
4.	What was it which "foretold ill for someone"?	Correct response	_____ 1
		Incorrect response	_____ 0

NARRATIVE -- THE AVENGER
(continued)

PART II (continued)

Question	Rating Guide	Pupil Rating
Meaning from Context		
5. Explain: The boy considered himself fully armed	Correct response	_____ 1
	Incorrect response	_____ 0
Recognizing Details		
6. What were Ray's weapons?	Complete response	_____ 2
	Accurate response, but incomplete	_____ 1
	Inaccurate response	_____ 0
Synthesis of Ideas Obtained from Material		
7. Ray is said to be a wild boy. What does this mean exactly?	Superior response indicating ability to synthesize	_____ 2
	Adequate response	_____ 1
	Incorrect response	_____ 0
Organization of Ideas and Carrying Through a Process in Orderly Sequence		
8. What was Ray's plan? List the steps in the order in which they were being carried out.	Superior organization	_____ 2
	Some organization but response incomplete	_____ 1
	Inadequate response	_____ 0

NARRATIVE --- THE AVENGER
(continued)

PART II (continued)

Question	Rating Guide	Pupil Rating
Ability to Draw and Support Conclusions		
9. Why was Ray not afraid to meet the wolves?	Superior response indicating capacity to derive meaning	_____ 2
	Adequate response. Some insightfulness	_____ 1
	Inadequate response	_____ 0
Interpretation		
10. What message of cheer could Ray have given the deer which passed his hiding place?	Superior response indicating capacity to interpret	_____ 2
	Adequate response indicating some recognition of impliction	_____ 1
	Inadequate response	_____ 0
Interpretation		
11. According to the story, what gives the timber wolf the advantage over the animal he is chasing?	Superior response indicating capacity to grasp meaning of material	_____ 2
	Adequate response indicating some capacity to grasp meaning.	_____ 1
	Inadequate response	_____ 0

APPENDIX D

PILOT STUDY

PILOT STUDY

The purposes and findings of the pilot study are presented in this section.

I. READING

VAN WAGENEN ANALYTICAL READING SCALES

A. Testing was conducted in order to determine whether the Intermediate Form (Grades 4 - 6) or the Junior Form (Grades 6 - 9) of the Van Wagenen Analytical Reading Scale-Form M, should be used in the main study. An examination of the distribution of scores for the Intermediate Form M and a comparison with the results of the Gates Reading Survey, Form D indicated that the Intermediate Form M of the Van Wagenen Analytical Reading Scales was a useful instrument for determining the reading ability of a grade six class.

B. Data were obtained on the intercorrelations of the subscales on the Van Wagenen Analytical Reading Scales, Intermediate Division - Form M. These are presented in

Table LXIII. The data on the correlations presented in Table LXIII indicate marked associations for the subscale score with the total score and generally moderate associations among the subscales. As the unexplained variance among the subscales was relatively high, a decision was made to use the subscale scores as well as the total score in the major study. It would appear that one global factor is being measured by all the subscales but each individual subscale is measuring other independent factors.

NARRATIVE TEST

A. A comparison was made of the free responses of a grade six class to selected reading passages of varying length and content. A decision was made to include the narrative passage, The Avenger, in the test battery.

B. Procedures were undertaken to refine the comprehension section of the Narrative Test. The suitability of specific questions was determined through testing and optimum time limits were established.

C. In order to determine whether the Narrative Test would

TABLE LXIII

INTERCORRELATIONS AMONG TOTAL SCORE AND SUBTEST SCORES FOR THE VAN WAGENEN ANALYTICAL READING SCALES, INTERMEDIATE DIVISION FORM M (N = 25)

Test	The Van Wagenen Analytical Reading Scale				
	Total Score	Central Thought	Simple Details	Related Ideas	Inferences
Central Thought	.809**				
Simple Details	.913**	.627**			
Related Ideas	.722**	.489**	.500**		
Inferences	.865**	.549**	.784**	.578**	
Interpretation	.908**	.754**	.823**	.545**	.712**

**p < .01

provide an estimate of reading ability, correlation relationships with the Gates Reading Survey D, Form 3 were obtained. The results are presented in Table LXIV.

TABLE LXIV

CORRELATION BETWEEN NARRATIVE SCORE AND GATES READING SURVEY D, FORM 3 (N=23)

	Gates Reading Survey			
Variable	Speed	Vocabulary	Comprehension	Av. Gr. Score
Narrative	.603**	.580**	.596**	.675**

** $p < .01$

The above correlations ($p < .01$) indicate a moderate association with the standardized test of reading ability. These findings suggest that the Narrative Test, while measuring essentially the same global factor as the standardized test, also measures different aspects of reading.

D. Test reliability of the Narrative Test was estimated through the the test-retest method. Measurements were obtained for sixty-four subjects.

II. COGNITIVE STYLES

THE EMBEDDED FIGURES TEST

Following practice tests, the EFT was administered to five grade-six subjects in order to determine response to the procedure. Interest and effort were sustained throughout the test. Variability in performance was noted.

OBJECT SORTING TEST

The ease of identification of the 50 line drawings used in the Object Sorting Test was determined. Three drawings were redone as a result of the findings. The drawings were subsequently retested.

APPENDIX E

GROUP MEANS AND STANDARD DEVIATIONS

TABLE LXV

GROUP MEANS AND STANDARD DEVIATIONS FOR SIXTY-EIGHT (68) VARIABLES, N=72

Variable		Mean[a] Scores	Standard Deviations
1.	VW Central Thought	16.056	2.437
2.	VW Simple Details	17.486	2.156
3.	VW Related Ideas	17.083	2.174
4.	VW Inferences	16.597	2.094
5.	VW Interpretation	16.014	1.842
6.	VW Total Score	83.236	8.211
7.	WISC Full Scale IQ	117.528	11.722
8.	WISC Verbal IQ	116.875	12.175
9.	WISC Performance IQ	114.944	12.338
10.	WISC Information	12.347	2.686
11.	WISC Comprehension	12.431	3.443
12.	WISC Arithmetic	12.222	2.016
13.	WISC Similarities	13.611	2.268
14.	WISC Vocabulary	12.736	2.680
15.	WISC Picture Completion	13.208	2.897
16.	WISC Picture Arrangement	11.625	2.635
17.	WISC Block Design	11.486	2.706
18.	WISC Object Assembly	11.889	3.392
19.	WISC Coding	12.653	2.524
20.	Van Wagenen + Narrative	99.944	11.877
21.	Narrative	16.708	5.141
22.	Embedded Figures Test	33.273	21.117
23.	OST Number of Groups of Two or More Objects	14.500	3.689
24.	OST Number of Single Objects	4.639	3.605
25.	OST Number of Groups	19.000	5.734
26.	OST Average Number of Objects per Group	3.394	1.429
27.	OST Mean Level of Abstraction	1.872	0.310
28.	OST Percentage of Conceptual Definitions	27.272	15.878

TABLE LXV
(continued)

Variable		Mean[a] Scores	Standard Deviations
29.	OST Percentage of Functional Definitions	33.809	16.651
30.	OST Percentage of Concrete Definitions	38.915	18.166
31.	OST Percentage of Conceptual and Functional Definitions	61.081	18.167
32.	WAT Noun-Noun	15.125	3.688
33.	WAT Adjective-Adjective	7.819	2.370
34.	WAT Verb-Verb	6.389	2.299
35.	WAT Total Form Class	29.333	6.879
36.	WAT Syntagmatic Response	8.125	5.482
37.	WAT Paradigmatic Response	31.542	5.850
38.	WAT Noun-Coordinate Noun	9.722	5.595
39.	WAT Noun-Supraordinate Noun	5.236	2.938
40.	WAT Adjective-Antonym	2.056	2.773
41.	WAT Whole-Part	0.708	1.041
42.	Proverb Correct	2.611	2.341
43.	Proverb Omit	0.319	0.668
44.	Proverb Definition	4.931	1.802
45.	Proverb Other	1.750	1.821
46.	Proverb General	5.819	1.226
47.	Proverb Concrete	0.875	1.087
48.	Proverb Metaphorical	2.764	1.939
49.	Proverb Mixed Literal and Metaphorical	2.125	1.363
50.	Proverb Literal	1.806	1,990
51.	Proverb Rating	2.672	0.779
52.	Spontaneous Flexibility	2.389	1.757
53.	Synonym V10	4.486	2.149
54.	Function V10	3.306	2.504
55.	Description V10	0.875	0.948
56.	Function and Description V10	1.278	1.436
57.	Total Function - Description V10	5.458	2.123
58.	Error V10	0.056	0.231

TABLE LXV
(continued)

Variable	Mean[a] Scores	Standard Deviations
59. Synonym V40	13.167	4.827
60. Function V40	5.917	3.422
61. Description V40	3.486	1.808
62. Function and Description V40	1.736	1.592
63. Total Function - Description V40	11.125	3.025
64. Error V40	15.694	3.165
65. Omissions V40	13.167	3.965
66. Wrong Definition V40	2.014	1.649
67. Clang Association V40	0.236	0.569
68. Misinterpretation V40	0.278	0.676

[a]With the exception of WISC scores, the scores reported in this column are raw scores.

APPENDIX F

SEX COMPARISONS

TABLE LXVI

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON A QUALITATIVE ANALYSIS OF VOCABULARY

Item	Boys (N=38)		Girls (N=34)		t	p
	Mean	S.D.	Mean	S.D.		
Synonym V10	4.89	1.73	4.03	2.43	1.729	n.s.
Function V10	2.87	2.05	3.79	2.82	-1.582	n.s.
Description V10	0.89	0.97	0.85	0.91	0.185	n.s.
Function and Description V10	1.34	1.53	1.21	1.30	0.399	n.s.
Total Function and Description V10	5.11	1.73	5.85	2.40	-1.505	n.s.
Synonym V40	14.37	3.88	11.82	5.33	2.300	< .05
Function V40	5.42	2.86	6.47	3.84	-1.306	n.s.
Description V40	3.68	1.88	3.26	1.67	0.983	n.s.
Function and Description V40	1.79	1.64	1.68	1.51	0.299	n.s.
Total Function and Description V40	10.87	2.36	11.41	3.57	-0.758	n.s.
Error V40	14.74	2.66	16.76	3.29	-2.847	< .01
Omission V40	12.11	3.57	14.35	3.99	-2.488	< .05
Wrong Definition V40	2.08	1.38	1.94	1.88	0.352	n.s.
Clang Association V40	0.21	0.41	0.26	0.70	-0.401	n.s.
Misinterpretation V40	0.34	0.77	0.21	0.53	0.852	n.s.

Note: For 70 df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

TABLE LXVII

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON A PROVERBS TEST

Item	Boys (N=38)		Girls (N=34)		t-values	p
	Mean	S.D.	Mean	S.D.		
Proverb Correct	2.95	2.53	2.24	2.00	1.295	n.s.
Proverb Omit	0.24	0.53	0.41	0.77	-1.112	n.s.
Proverb Definition	5.03	1.74	4.82	1.84	0.474	n.s.
Proverb Other	1.74	1.76	1.76	1.86	-0.064	n.s.
Proverb General	5.89	1.17	5.74	1.27	0.548	n.s.
Proverb Concrete	0.89	1.10	0.85	1.06	0.162	n.s.
Proverb Metaphorical	2.97	1.88	2.53	1.94	0.970	n.s.
Proverb Mixed	1.92	1.31	2.35	1.37	-1.350	n.s.
Proverb Literal	1.84	1.98	1.76	1.97	0.164	n.s.
Proverb Rating	2.72	0.79	2.62	0.75	0.573	n.s.

Note - For 70 df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

TABLE LXVIII

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON A WORD ASSOCIATION TEST

Item	Boys (N-38)		Girls (N=34)		t	p
	Mean	S. D.	Mean	S. D.		
WAT Noun - Noun	14.66	3.76	15.65	3.47	-1.138	n.s.
WAT Adjective - Adjective	7.05	2.83	8.68	1.18	-3.070	< .01
WAT Verb - Verb	5.63	2.40	7.24	1.80	-3.134	< .01
WAT Total Form Class	27.34	7.54	31.56	5.09	-2.710	< .01
WAT Syntagmatic Response	9.79	6.11	6.26	3.80	2.858	< .01
WAT Paradigmatic Response	24.95	6.38	33.32	4.46	-2.537	< .05
WAT Noun - Coordinate	8.55	6.73	11.03	3.40	-1.910	n.s.
WAT Adjective - Antonym	5.00	3.04	5.50	2.75	-0.718	n.s.
WAT Noun - Supraordinate	1.53	2.12	2.65	3.22	-1.736	n.s.
WAT Whole - Part	0.87	1.13	0.53	0.88	1.389	n.s.

Note -- For 70 df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

TABLE LXIX

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS
ON MEASURES OF READING COMPREHENSION

Item	Boys (N=38)		Girls (N=34)		t	p
	Mean	S.D.	Mean	S.D.		
VW Central Thought	16.34	2.26	15.74	2.55	1.055	n.s.
VW Simple Detail	17.79	1.91	17.15	2.33	1.268	n.s.
VW Related Ideas	17.37	1.93	16.76	2.35	1.180	n.s.
VW Inferences	16.76	2.22	16.41	1.90	0.708	n.s.
VW Interpretation	16.03	1.60	16.00	2.06	0.060	n.s.
VW Total Score	84.29	7.31	82.06	8.86	1.153	n.s.
Narrative Test	17.37	4.46	15.97	5.65	1.154	n.s.
VW + Narrative	101.66	9.80	98.03	13.43	1.300	n.s.

Note -- For 70 df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

TABLE LXX

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

Item	Boys (N=38)		Girls (N=34)		t	p
	Mean	S. D.	Mean	S. D.		
WISC Full Scale IQ	118.97	12.41	115.91	10.48	1.108	n.s.
WISC Verbal IQ	119.79	11.23	113.62	12.18	2.205	< .05
WISC Performance IQ	114.13	13.79	115.85	10.18	-0.538	n.s.
WISC Information	12.61	2.42	12.06	2.89	0.860	n.s.
WISC Comprehension	13.05	3.61	11.74	3.04	1.640	n.s.
WISC Arithmetic	12.61	2.22	11.79	1.62	1.728	n.s.
WISC Similarities	14.08	2.18	13.09	2.21	1.884	n.s.
WISC Vocabulary	13.45	2.18	11.94	2.91	2.464	< .05
WISC Picture Completion	13.39	3.15	13.00	2.52	0.574	n.s.
WISC Picture Arrangement	11.74	2.44	11.50	2.80	0.378	n.s.
WISC Block Design	11.26	2.73	11.74	2.62	-0.737	n.s.
WISC Object Assembly	11.61	3.34	12.21	3.38	-0.748	n.s.
WISC Coding	12.24	3.08	13.12	1.51	-1.491	n.s.

Note -- For 70 df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

TABLE LXXI

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS
ON A MEASURE OF SPONTANEOUS FLEXIBILITY

Item	Boys (N=38)		Girls (N=34)		t	p
	Mean	S. D.	Mean	S. D.		
Spontaneous Flexibility	2.05	1.61	2.76	1.82	-1.741	n.s.

Note - For 70 df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

TABLE LXXII

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON AN EMBEDDED FIGURES TEST

Item	Boys (N=38)		Girls N=34)		t	p
	Mean	S.D.	Mean	S. D.		
Embedded Figures Test	28.54	17.50	38.56	23.15	-2.056	< .05

Note - For 70 df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

TABLE LXXIII

COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON A MEASURE OF CONCEPTUAL DIFFERENTIATION

ITEM	Boys (N=38) Mean	SD	Girls (N=34) Mean	SD	t	p
Number of Groups of Two or More Objects	15.13	3.91	13.79	3.22	1.551	n.s.
Number of Single Objects	5.03	3.51	4.21	3.61	0.964	n.s.
Number of Groups	19.89	5.68	18.00	5.54	1.410	n.s.
Average Number of Objects per Group	3.29	1.49	3.51	1.33	-0.675	n.s.
Mean Level of Abstraction	1.88	0.32	1.87	0.29	0.138	n.s.
Percentage Conceptual Responses	28.64	16.27	25.75	15.04	0.769	n.s.
Percentage Functional Responses	31.75	15.78	36.11	17.04	-1.112	n.s.
Percentage Concrete Responses	39.61	17.69	38.14	18.39	0.342	n.s.
Percentage Functional and Conceptual Responses	60.39	17.69	61.86	18.39	-0.341	n.s.

Note: For 70df, t's of 2.000 and 2.660 are significant at the .05 and .01 levels respectively.

APPENDIX G

VARIMAX ROTATED FACTORS

TABLE LXXIV

VARIMAX ROTATED FACTORS[a]

	Test	Communality h^2	FACTORS I	II	II	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
1	VW Central Thought	66	23	45	08	50	16	-06	-10	04	-03	08	-10	17	24
2	VW Simple Details	70	25	19	-03	73	05	02	05	14	02	-21	03	01	-05
3	VW Related Ideas	67	35	27	-02	60	15	-12	-06	15	07	17	03	-16	05
4	VW Inferences	71	05	19	02	76	25	09	05	02	-04	-05	07	-09	02
5	VW Interpretation	69	23	02	16	75	03	-04	18	-10	-03	-01	-01	-03	-10
6	VW Total Score	96	29	31	06	86	17	-03	02	07	-00	-00	-00	-02	05
7	WISC Full Scale IQ	98	09	70	02	18	11	-06	61	08	06	-03	20	04	08
8	WISC Verbal IQ	91	20	83	-06	25	12	01	27	06	09	05	03	05	11
9	WISC Performance IQ	91	-04	33	11	06	06	-16	81	05	02	-08	31	02	03
10	WISC Information	54	27	55	-02	24	-02	07	27	13	00	-08	07	07	01
11	WISC Comprehension	75	04	71	-03	22	11	03	32	-09	21	02	-03	-15	00
12	WISC Arithmetic	64	-06	51	00	15	-11	08	08	42	-06	24	03	01	31
13	WISC Similarities	67	12	60	-03	18	24	-04	27	02	-02	05	-13	25	25
14	WISC Vocabulary	92	31	82	-06	10	31	-01	08	00	02	-03	18	01	-03
15	WISC Picture Completion	62	08	44	09	-09	04	-10	37	-18	-07	-13	32	00	-31
16	WISC Picture Arrangement	58	-00	25	-01	17	03	-14	24	16	01	00	61	07	-04
17	WISC Block Design	77	06	24	10	01	-20	-05	78	07	-03	01	-19	03	-02
18	WISC Object Assembly	71	-07	13	-00	-02	05	-00	81	05	07	-05	11	-06	-04
19	WISC Coding	64	-28	-11	05	15	22	-10	27	01	07	-25	18	19	51
20	VW + Narrative	93	34	33	07	79	21	-09	05	10	08	02	01	01	04
21	Narrative	52	33	28	07	45	21	-15	09	12	19	05	03	05	01
22	Embedded Figures Test	75	-29	-16	17	-36	09	15	-63	-06	07	05	21	07	-01
23	OST Number of Groups of Two or More Objects	84	00	-02	-02	-09	02	87	-11	12	14	-01	06	-15	07
24	OST Number of Single Objects	70	-07	12	-10	04	-08	54	-04	18	-17	04	-25	41	-29
25	OST Number of Groups	93	-05	04	-10	-01	-03	88	-12	19	-12	07	-13	18	-11
26	OST Average Number of Objects per Group	87	-07	05	03	01	-04	-90	08	-20	-02	-00	04	-00	-03
27	OST Mean Level of Abstraction	87	18	-01	-04	14	09	35	07	81	-15	07	-02	04	00
28	OST Percentage Conceptual	80	20	20	-02	27	11	11	04	75	03	-04	-22	-02	-00
29	OST Percentage Functional	67	-01	-36	-13	-29	-04	43	06	05	-26	03	39	15	06
30	OST Percentage Concrete	92	-17	16	14	03	-06	-49	-09	-71	21	01	-17	-12	-06
31	OST Percentage Conceptual and Functional	92	17	-16	-14	-03	06	49	09	71	-21	-01	17	12	06
32	WAT Noun-Noun	80	03	04	77	24	-03	04	-05	16	19	-08	-12	-18	16
33	WAT Adjective-Adjective	75	08	-03	81	-09	-04	-08	04	-04	-03	03	24	-03	04
34	WAT Verb-Verb	78	18	-16	78	01	02	-04	21	-17	-16	-01	02	10	-05
35	WAT Total Form Class	95	10	-04	95	10	-03	-02	06	02	03	-03	03	-07	08
36	WAT Syntagmatic	86	-15	03	-90	-02	-10	09	05	-02	01	06	06	03	03

TABLE LXXIV (continued)

	Test	Communality h^2	FACTORS I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
37	WAT Paradigmatic	85	12	03	90	01	06	-09	-07	-02	03	-06	-08	-05	-02
38	WAT Noun-Coordinate Noun	66	-13	01	53	07	04	21	15	-18	-09	-14	-18	31	-20
39	WAT Adjective-Antonym	82	05	18	70	02	-13	-15	-11	-03	01	12	49	-04	01
40	WAT Noun-Supraordinate	58	06	-17	-11	02	26	-04	04	11	-11	-03	-65	12	-05
41	WAT Whole-Part	57	13	18	04	-08	03	00	-10	03	10	-03	-02	-11	69
42	Proverb Correct	75	67	28	12	20	23	07	08	-14	-12	01	13	-21	10
43	Proverb Omit	64	01	-02	26	-33	-20	-06	02	48	-03	-21	01	-04	-38
44	Proverb Definition	91	86	20	05	24	18	07	02	08	09	02	-07	03	07
45	Proverb Other	90	-85	-19	-15	-12	-11	-05	-03	-25	-07	06	06	-06	07
46	Proverb General	82	65	00	01	40	22	00	-02	-27	01	15	04	17	25
47	Proverb Concrete	69	-75	00	-16	-23	-12	05	01	00	03	-03	-05	-16	-04
48	Proverb Metaphorical	83	77	18	10	22	15	01	03	05	-04	14	-08	-32	02
49	Proverb Mixed	64	08	07	-12	05	06	-01	-01	09	27	-12	11	71	02
50	Proverb Literal	86	-81	-21	-09	-14	-13	-01	-02	-26	-14	01	-01	-15	08
51	Proverb Rating	89	86	23	10	17	12	-02	02	18	10	04	-03	-04	01
52	Spontaneous Flexibility	27	-17	23	-00	24	02	-14	21	-05	-12	04	-01	13	-18
53	Synonym V10	96	26	30	-03	20	84	01	-10	-01	-13	-14	-03	-01	-01
54	Function V10	96	-27	-23	05	-16	-72	02	06	07	-46	-24	06	-05	00
55	Description V10	80	02	-09	-12	-03	-02	-01	-02	02	12	86	-10	-05	01
56	Function and Description V10	92	09	04	-01	02	02	-05	05	-16	92	06	01	17	04
57	Total Function - Description	95	-25	-28	-00	-19	-85	-02	10	-02	14	14	03	04	03
58	Error V10	36	-13	-24	30	-09	-05	14	05	21	-03	-05	08	-28	-17
59	Synonym V40	94	32	54	01	32	65	-03	07	04	-07	-03	-01	-07	04
60	Function V40	89	-33	-13	-01	-16	-68	-01	-03	-03	-36	-36	06	05	-12
61	Description V40	76	24	16	-09	-07	-01	07	-12	-09	01	76	18	-04	-16
62	Function and Description V40	85	04	-00	01	-00	-03	-02	00	-10	90	05	09	09	08
63	Total Function-Description V40	86	-22	-06	-06	-23	-79	02	-10	-14	08	07	22	08	-19
64	Error V40	87	-29	-78	05	-27	-23	03	-01	08	04	-02	-19	03	11
65	Omissions V40	86	-27	-70	05	-29	-20	12	-03	12	03	11	-18	31	06
66	Wrong Definition V40	43	-06	09	02	20	21	-16	02	-03	-07	-04	12	-53	08
67	Clang Association V40	48	16	00	-02	-02	-39	-20	02	-12	-19	-29	-10	00	34
68	Misinterpretation V40	63	22	24	-05	-01	-07	-02	04	-14	34	-43	-07	-35	-27
	Percentage of Common Variance	100	13.46	13.20	10.96	10.81	9.00	7.36	6.97	6.69	5.46	4.33	4.20	3.94	3.61
	Percentage of Total Variance	76.52	10.30	10.10	8.39	8.27	6.88	5.63	5.33	5.12	4.18	3.31	3.21	3.01	2.77

[a]Decimal points omitted

APPENDIX H

RAW DATA

RAW SCORES

The raw scores obtained by the subjects are listed on the following pages. The numbers used as column headings follow the classification presented below.

Item		Number
Sex		1
Age in Months		2
Reading		3 - 10
3	Van Wagenen Central Thought	
4	Van Wagenen Simple Details	
5	Van Wagenen Related Ideas	
6	Van Wagenen Inference	
7	Van Wagenen Interpretation	
8	Van Wagenen Total Score	
9	Narrative Test	
10	Van Wagenen + Narrative	
Intelligence		11 - 23
11	WISC Full Scale IQ	
12	WISC Verbal IQ	
13	WISC Performance IQ	
14	WISC Information	
15	WISC Comprehension	
16	WISC Arithmetic	
17	WISC Similarities	
18	WISC Vocabulary	
19	WISC Picture Completion	
20	WISC Picture Arrangement	
21	WISC Block Design	
22	WISC Object Assembly	
23	WISC Coding	
Spontaneous Flexibility		24
Cognitive Style		25 - 29

Item	Number
Cognitive Style (continued)	
25 Embedded Figures Test	
26 Object Sorting Test: Number of Groups of Two or More Objects	
27 Object Sorting Test: Number of Single Objects	
28 Object Sorting Test : Number of Groups	
29 Object Sorting Test : Average Number of Objects per Group	
Level of Abstraction	30 - 34
30 Object Sorting Test : Mean Level of Abstraction	
31 Object Sorting Test : Percentage of Conceptual Responses	
32 Object Sorting Test : Percentage of Functional Responses	
33 Object Sorting Test : Percentage of Concrete Responses	
34 Object Sorting Test : Percentage of Conceptual and Functional Responses	
Language	35 - 70
35 - 44 Word Association	
45 - 54 Proverbs	
55 - 70 Vocabulary	
35 Word Association Noun-Noun	
36 Word Association Adjective-Adjective	
37 Word Association Verb-Verb	
38 Word Association Total Form Class	
39 Word Association Syntagmatic Response	
40 Word Association Paradigmatic Response	
41 Word Association Noun-Coordinate Noun Response	
42 Word Association Adjective-Antonym Response	
43 Word Association Noun-Supraordinate Noun Response	
44 Word Association Whole-Part Response	
45 Proverb Correct	
46 Proverb Omit	
47 Proverb Definition	
48 Proverb Other	

Item	Number
Language (continued)	
49 Proverb General	
50 Proverb Concrete	
51 Proverb Metaphorical	
52 Proverb Mixed	
53 Proverb Literal	
54 Proverb Rating	
55 Vocabulary Synonym V10	
56 Vocabulary Function V10	
57 Vocabulary Description V10	
58 Vocabulary Function and Description V10	
59 Vocabulary Total Function-Description V10	
60 Vocabulary Error V10	
61 Vocabulary Synonym V40	
62 Vocabulary Function V40	
63 Vocabulary Description V40	
64 Vocabulary Function and Description V40	
65 Vocabulary Total Function-Description V40	
66 Vocabulary Error V40	
67 Vocabulary Omission V40	
68 Vocabulary Wrong Definition V40	
69 Vocabulary Clang Association V40	
70 Vocabulary Misinterpretation V40	

RAW SCORES

ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	2	143	18	20	18	19	17	92	22	114	138	133	138	16	18
2	2	140	17	20	16	20	17	90	19	109	136	128	127	14	18
3	1	139	12	15	18]	13	12	70	10	80	120	120	115	14	10
4	2	146	18	18	16	19	17	88	24	112	137	130	138	13	17
5	1	138	18	20	17	17	16	88	23	111	128	128	122	18	11
6	2	140	17	16	17	14	60	80	19	99	134	135	127	16	18
7	2	145	13	16	19	19	18	84	17	101	117	104	128	12	7
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1	144	16	20	19	18	16	89	22	111	117	114	118	11	16
10	1	139	20	18	19	16	19	92	22	114	128	120	131	13	13
11	2	144	17	19	20	20	17	93	21	114	136	137	128	13	17
12	1	141	13	15	14	17	15	74	15	89	121	110	129	9	13
13	2	145	14	18	16	15	17	80	10	90	100	106	95	9	8
14	2	148	16	20	17	19	16	88	27	115	111	118	101	12	12
15	2	136	19	19	19	18	17	92	14	106	140	149	122	18	19
16	2	147	17	20	20	16	17	90	23	113	120	115	122	10	15
17	2	145	19	18	17	17	16	88	18	106	126	119	129	13	10
18	1	138	13	17	13	15	14	72	10	82	107	101	113	10	10
19	1	140	18	11	12	12	13	66	17	83	117	105	127	11	12
20	1	142	15	18	14	15	13	75	18	93	112	104	120	14	8
21	2	141	16	20	18	17	19	90	25	115	107	113	99	10	11
22	1	143	15	12	17	14	12	70	11	81	112	109	113	8	11
23	1	142	14	16	14	14	14	72	12	84	97	104	90	11	8
24	2	140	18	16	17	15	14	80	12	92	127	125	124	12	12
25	2	143	17	17	15	15	15	79	16	95	92	104	80	11	11
26	1	137	16	14	15	15	16	76	11	87	106	105	106	10	10

ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
27	1	144	12	13	15	15	17	72	12	84	96	94	100	9	8
28	2	147	16	18	19	18	15	86	14	100	121	120	118	10	15
29	1	143	15	18	19	17	18	87	21	108	115	105	122	11	09
30	2	148	17	20	17	18	17	89	14	103	117	116	115	12	12
31	1	141	13	19	13	15	12	72	13	85	117	114	117	10	12
32	1	139	16	14	16	15	15	76	12	88	117	116	114	12	13
33	2	141	19	13	16	13	13	74	20	94	108	118	96	9	14
34	2	145	19	18	19	20	18	94	14	108	117	116	114	13	8
35	1	144	19	19	20	18	17	93	22	115	127	120	129	14	13
36	2	143	15	18	13	17	17	80	13	93	136	131	133	14	15
37	1	144	19	18	19	20	18	94	27	121	133	145	113	16	20
38	2	143	13	17	17	14	17	78	23	101	131	126	129	14	18
39	2	143	13	16	16	16	13	74	10	84	102	104	100	10	9
40	1	136	16	18	18	15	19	86	13	99	110	105	114	9	10
41	1	147	18	15	19	17	18	87	11	98	109	116	111	12	10
42	2	144	17	16	17	15	15	80	24	104	119	123	111	12	14
43	1	144	19	18	18	18	16	87	15	104	120	129	107	14	16
44	2	135	16	19	20	17	15	87	19	106	106	110	100	10	10
45	1	145	18	19	19	19	17	92	21	113	107	106	107	10	8
46	2	144	16	19	18	17	16	86	16	102	124	124	120	14	16
47	2	140	11	16	15	10	13	65	18	83	106	104	107	11	6
48	2	147	17	19	20	14	15	85	14	99	118	120	113	11	15
49	2	138	15	17	19	13	17	81	15	96	117	125	106	12	13
50	1	138	18	20	18	18	17	91	19	110	116	120	108	15	11

ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
51	2	137	19	18	20	17	18	92	16	108	128	135	115	18	15
52	2	138	20	19	17	17	15	88	14	102	128	128	124	14	16
53	1	147	17	18	20	19	20	94	21	115	124	121	122	12	15
54	1	136	14	17	15	15	14	75	7	82	113	113	111	13	8
55	1	145	15	20	18	19	18	90	21	111	128	128	124	17	14
56	1	139	13	18	16	18	17	82	3	85	107	106	107	11	10
57	2	146	16	20	19	18	18	91	16	107	123	123	118	14	16
58	2	147	16	17	15	16	17	81	11	92	96	95	99	9	11
59	2	143	19	20	19	19	17	94	21	115	125	130	114	14	15
60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	2	146	18	18	18	20	16	90	24	114	99	105	92	10	10
62	2	138	17	18	18	17	15	85	20	105	112	110	111	12	7
63	1	142	10	15	14	14	15	68	12	80	107	103	111	8	12
64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	2	149	14	16	18	17	16	81	13	94	119	116	118	13	12
66	2	146	18	20	19	18	18	93	17	110	116	130	97	19	15
67	1	139	15	18	19	17	17	86	17	103	130	129	125	20	13
68	1	143	19	18	18	17	17	89	21	110	136	129	136	14	14
69	1	145	18	20	20	18	18	94	21	115	112	118	103	13	11
70	1	141	14	18	18	17	15	82	16	98	117	108	125	9	11
71	2	145	10	14	13	16	15	68	11	79	124	116	128	11	15
72	2	138	15	13	14	16	15	73	11	84	104	105	101	13	8
73	2	146	15	17	14	17	12	75	16	91	100	101	99	10	9
74	1	148	19	19	18	19	16	91	26	117	134	134	128	14	20
75	1	146	12	18	13	16	16	75	10	85	105	89	122	9	8

RAW SCORES

ID	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	12	15	15	17	12	13	15	20	1	7.958	16	2	18	3.000	1.750	18.750
2	17	14	17	19	12	14	12	12	2	26.991	19	4	23	2.421	2.125	50.000
3	13	15	14	12	13	13	10	13	2	54.750	15	7	22	2.866	2.076	23.076
4	15	17	12	13	12	18	17	17	2	3.641	12	2	14	4.000	2.000	27.272
5	16	13	14	16	14	12	12	12	7	16.833	12	6	18	3.666	1.916	8.333
6	14	17	13	12	11	14	16	16	2	4.641	18	2	20	2.666	2.000	33.333
7	10	10	14	18	14	12	15	11	2	36.000	16	4	20	2.875	2.000	25.000
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	12	13	12	13	12	11	11	13	6	33.533	18	0	18	2.777	2.000	27.777
10	13	14	13	13	18	14	15	12	2	34.400	14	8	22	3.000	2.285	57.142
11	17	16	16	16	15	10	15	14	1	8.075	8	5	13	5.625	1.625	25.000
12	10	15	11	14	8	15	20	14	1	17.216	16	6	22	2.750	1.750	25.000
13	9	11	9	12	13	9	7	13	1	40.241	15	8	23	2.800	1.866	21.428
14	13	14	14	11	11	9	7	13	1	41.966	18	2	20	2.666	2.117	47.058
15	16	19	17	14	11	15	14	12	1	14.383	16	14	30	1.250	2.250	43.750
16	10	15	12	16	14	12	15	9	5	17.641	5	4	9	9.200	1.400	20.000
17	12	15	15	16	14	13	12	16	1	22.208	15	10	25	2.666	2.266	53.333
18	11	12	9	12	10	13	13	11	2	65.425	16	11	27	2.437	2.250	43.750
19	10	11	10	13	12	14	13	17	4	22.425	6	0	6	8.333	1.500	00.000
20	11	10	10	10	12	14	15	13	2	11.216	14	3	17	3.357	2.071	35.700
21	12	14	13	12	10	7	7	13	1	39.133	11	4	15	4.181	1.636	27.272
22	14	12	12	12	9	9	15	14	4	116.883	19	2	21	2.526	1.578	10.526
23	11	12	9	7	9	7	7	13	1	69.125	14	8	22	3.000	2.153	30.769
24	16	14	16	14	16	12	10	15	1	22.283	11	3	14	4.272	2.500	70.000
25	9	12	10	9	4	12	4	7	1	18.216	19	10	29	2.105	1.526	15.789
26	11	12	11	13	12	7	8	14	1	66.041	18	12	30	2.111	1.777	11.111

ID	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
27	12	10	6	12	7	10	8	13	2	55.991	12	4	16	2.833	1.583	00.000
28	13	15	13	13	14	10	12	14	5	32.916	17	6	23	2.588	1.823	23.529
29	14	11	9	13	12	12	15	14	5	24.591	13	2	15	3.692	1.846	15.384
30	12	15	12	12	10	10	14	15	1	28.900	2	2	23	2.285	1.714	28.571
31	11	15	13	19	10	13	18	12	5	32.191	19	12	31	2.000	1.842	21.052
32	11	13	14	14	9	11	13	13	3	50.833	15	4	19	3.066	2.133	40.000
33	11	14	16	16	10	5	5	8	1	72.425	19	7	26	2.263	1.684	00.000
34	12	17	13	7	13	9	15	16	4	12.733	17	4	21	2.705	2.000	23.529
35	11	15	13	13	18	15	14	11	3	30.991	14	6	20	3.142	1.857	28.571
36	14	17	15	17	13	15	14	15	8	19.466	13	11	24	3.000	1.538	7.692
37	12	19	19	14	13	11	10	11	2	23.575	9	0	9	5.555	1.666	22.222
38	12	13	14	19	13	12	15	12	1	30.516	19	4	13	2.421	1.684	21.052
39	11	12	11	10	12	10	8	10	2	56.083	19	2	21	2.526	1.788	21.052
40	11	13	11	8	10	12	15	15	1	31.641	14	2	16	3.428	1.714	14.285
41	10	11	12	13	10	12	11	12	1	22.183	11	0	11	4.545	1.181	9.090
42	14	14	14	14	12	10	11	11	3	24.275	14	6	20	3.142	2.357	57.142
43	14	15	14	14	13	7	6	15	3	77.408	13	4	17	3.053	1.615	15.384
44	16	13	9	8	11	11	8	12	2	19.300	16	4	20	2.875	2.375	50.000
45	10	15	12	13	8	11	8	15	1	26.950	13	2	15	3.694	1.792	15.384
46	10	14	15	18	10	11	11	14	4	42.591	7	0	7	7.142	1.142	00.000
47	11	13	12	12	10	12	14	7	1	25.841	9	1	10	5.444	1.666	11.111
48	12	13	15	12	12	11	14	10	1	25.950	18	1	19	2.722	2.055	27.777
49	16	17	12	12	9	12	10	11	1	22.050	15	6	21	3.066	2.153	38.461
50	11	15	14	13	15	7	9	12	4	64.450	15	0	15	3.333	2.133	46.666

ID	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
51	11	18	16	16	11	17	12	5	4	5.833	14	3	17	3.357	1.857	28.571
52	11	15	16	14	12	13	12	16	1	20.075	15	3	18	3.133	1.133	33.333
53	12	12	16	11	15	14	14	12	2	22.183	12	10	22	1.833	1.750	33.333
54	13	14	12	13	10	11	8	16	2	57.333	7	0	7	7.142	1.142	00.000
55	12	17	12	16	11	13	13	14	2	22.185	15	9	24	2.733	2.400	46.666
56	14	11	9	12	12	10	9	12	3	33.291	14	2	16	3.571	1.785	28.571
57	9	14	15	16	13	7	14	13	3	30.241	10	0	10	5.000	1.800	30.000
58	10	9	7	13	6	10	9	11	1	60.616	15	1	16	3.266	1.800	20.000
59	14	15	16	10	15	11	11	13	2	35.800	20	8	28	2.100	2.263	47.368
60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	12	11	11	9	9	8	5	13	1	51.833	12	10	22	3.333	2.000	33.333
62	14	14	13	12	12	12	10	12	1	24.116	17	7	24	2.524	2.170	29.411
63	11	12	9	9	12	10	12	15	1	29.475	14	2	16	3.428	1.571	14.285
64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	11	12	15	16	14	7	15	11	1	58.075	20	1	21	2.450	1.650	10.000
66	15	12	13	11	6	11	12	8	5	10.958	16	13	29	2.312	2.375	50.000
67	13	12	15	14	13	13	16	12	1	16.983	22	0	22	2.272	2.136	31.818
68	14	16	15	20	12	17	14	13	3	20.975	10	2	12	4.400	1.800	30.000
69	12	16	12	11	7	10	11	13	5	6.375	11	4	15	4.181	2.090	45.454
70	10	12	14	13	11	11	18	15	3	35.525	14	4	18	3.285	2.285	50.000
71	13	13	11	16	16	15	14	9	1	9.066	11	6	17	4.000	1.545	00.000
72	11	12	10	12	9	9	9	12	2	48.033	18	4	22	2.555	1.722	27.777
73	12	9	11	8	11	10	10	10	1	74.041	19	8	27	2.210	1.777	10.526
74	13	13	17	13	13	18	15	11	8	15.891	11	4	15	5.090	2.000	45.454
75	8	10	6	16	15	12	10	13		41.683	14	6	20	3.142	2.000	28.571

RAW SCORES

ID	32	33	34	35	36	37	38	39	40	41	42	43	44
1	37.500	43.062	56.250	20	9	9	38	7	7	9	5	0	1
2	18.750	31.250	68.750	17	9	5	31	11	29	6	6	0	1
3	61.538	15.384	84.614	9	8	5	22	13	27	5	5	5	0
4	45.454	27.272	72.726	20	10	7	37	5	35	8	4	0	5
5	75.000	16.666	83.333	10	9	7	26	7	33	6	7	5	0
6	33.333	33.333	66.666	8	5	5	18	22	18	5	0	2	0
7	50.000	25.000	75.000	15	9	8	32	3	37	12	9	2	1
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	44.444	27.777	72.221	2	10	9	39	2	38	13	8	0	2
10	14.285	28.571	71.427	19	10	7	36	2	38	15	8	4	0
11	12.500	62.500	37.500	15	9	5	29	14	26	3	8	0	0
12	25.000	50.000	50.000	16	6	8	30	8	32	11	1	9	0
13	57.143	21.428	78.571	15	4	3	22	22	18	7	3	0	0
14	17.647	35.294	64.705	15	6	5	26	13	27	7	6	0	3
15	37.500	18.750	81.250	17	7	5	29	12	28	5	6	0	2
16	00.000	80.000	20.000	19	10	8	37	2	38	13	9	1	0
17	20.000	26.666	73.333	20	10	8	38	2	38	13	9	0	0
18	37.500	18.750	81.250	17	9	8	34	3	37	15	7	3	0
19	50.000	50.000	50.000	9	8	6	23	12	28	6	7	1	0
20	35.700	28.500	71.400	19	10	5	34	6	34	12	8	2	2
21	9.090	63.636	36.362	19	10	8	37	1	39	13	9	0	2
22	36.842	52.631	47.368	15	8	4	27	10	30	8	6	5	3
23	53.846	15.384	84.615	16	9	8	33	7	33	12	6	1	0
24	10.000	20.000	80.000	17	6	4	27	12	28	8	4	6	1
25	21.052	63.157	36.841	16	8	7	31	7	33	14	0	8	0
26	55.555	33.333	66.666	17	10	8	35	5	35	10	8	0	0

ID	32	33	34	35	36	37	38	39	40	41	42	43	44
27	58.330	41.660	58.330	20	9	9	38	2	38	15	7	1	1
28	35.924	41.176	59.453	17	0	1	18	16	24	0	0	0	0
29	53.846	30.769	69.230	15	8	6	29	8	31	10	5	0	0
30	14.285	57.142	42.856	20	9	9	38	2	38	15	8	0	0
31	52.631	26.315	73.683	8	5	3	16	18	22	20	2	0	1
32	33.333	26.666	73.333	17	9	8	34	2	38	11	3	0	1
33	68.421	31.578	68.421	11	7	4	22	9	31	3	5	2	2
34	52.941	23.529	76.470	14	8	5	27	5	34	9	6	4	2
35	28.571	42.857	57.142	18	10	8	36	5	35	14	9	1	0
36	30.769	61.538	38.461	10	7	9	26	14	26	40	6	0	0
37	22.222	55.555	44.444	18	9	5	32	5	35	9	6	1	0
38	26.315	52.631	47.367	18	10	7	35	3	37	11	8	0	1
39	36.842	42.105	57.894	15	7	3	25	8	32	8	2	5	0
40	42.857	42.857	57.142	12	8	9	29	11	29	8	6	3	0
41	00.000	90.909	9.090	16	8	5	29	5	35	9	7	0	1
42	21.428	21.428	78.570	20	9	8	37	0	40	15	9	1	0
43	30.769	53.846	46.153	20	10	8	38	1	39	16	9	0	0
44	12.500	37.500	62.500	13	6	2	21	15	25	4	2	1	2
45	46.153	38.461	61.537	16	10	9	35	2	38	12	6	3	0
46	14.285	85.714	14.285	14	8	7	29	7	33	9	8	3	1
47	44.444	44.444	55.555	8	8	6	22	10	30	3	6	0	0
48	50.000	22.222	77.777	20	10	8	38	5	35	14	7	0	1
49	38.461	23.076	76.922	16	8	9	33	6	34	13	6	6	3
50	20.000	33.333	66.666	14	9	8	31	6	34	6	7	1	3

ID	32	33	34	35	36	37	38	39	40	41	42	43	44
51	28.571	42.857	57.142	9	9	9	27	7	33	4	6	0	0
52	20.000	46.666	53.333	11	2	2	15	8	32	2	0	3	2
53	8.333	58.333	41.666	15	9	8	32	5	34	12	1	6	1
54	14.285	85.714	14.285	15	9	9	33	6	34	8	7	1	2
55	46.666	6.666	93.332	15	8	7	30	5	35	12	1	9	0
56	42.857	28.571	71.428	19	9	8	36	5	35	11	8	0	0
57	20.000	50.000	50.000	8	1	2	11	21	19	2	1	2	1
58	40.000	40.000	60.000	16	8	10	34	7	33	8	2	4	0
59	31.578	21.052	78.946	12	9	3	24	17	23	7	8	0	0
60	-	-	-	-	-	-	-	-	-	-	-	-	-
61	33.333	33.333	66.666	10	3	3	16	19	21	6	1	5	0
62	58.823	11.764	88.234	12	4	6	22	13	18	2	1	1	1
63	28.571	57.142	42.856	14	10	3	27	12	28	11	1	3	0
64	-	-	-	-	-	-	-	-	-	-	-	-	-
65	45.000	45.000	55.000	11	9	5	25	7	33	4	7	0	0
66	37.500	12.500	87.500	12	0	1	13	15	25	5	0	4	0
67	50.000	18.181	81.818	18	9	9	36	3	37	14	8	0	0
68	20.000	50.000	50.000	20	9	10	39	2	38	13	8	1	0
69	18.181	36.363	63.635	18	6	7	31	4	36	16	0	15	0
70	28.571	21.428	78.571	10	9	8	27	10	20	7	1	2	0
71	45.454	54.545	45.454	11	5	5	21	17	23	2	2	0	0
72	22.222	50.000	49.999	15	8	6	29	13	27	10	6	2	1
73	47.368	42.105	57.894	17	9	7	33	2	38	14	7	0	0
74	9.090	45.454	54.544	20	8	7	35	5	35	12	8	2	1
75	42.857	28.571	71.428	11	9	7	27	9	29	8	4	2	0

RAW SCORES

ID	45	46	47	48	49	50	51	52	53	54	55	56	57
1	6	0	7	0	7	0	5	2	0	3.571	6	0	0
2	3	1	5	1	6	0	3	1	1	2.666	5	4	0
3	1	1	4	2	5	1	3	3	0	2.833	2	4	1
4	5	0	5	2	7	0	3	3	1	3.142	4	3	0
5	4	0	7	0	7	0	5	2	0	3.428	4	3	1
6	1	0	3	4	3	4	0	3	4	1.714	3	5	1
7	5	1	6	0	6	0	5	1	0	3.666	7	3	0
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	6	0	7	0	7	0	7	0	0	3.571	3	4	2
10	2	0	7	0	7	0	4	3	0	2.571	5	2	1
11	7	0	6	1	7	0	5	2	0	3.285	6	2	1
12	3	0	6	1	6	1	4	3	0	3.285	4	4	1
13	0	0	4	3	7	0	1	1	5	1.571	2	8	0
14	3	0	7	0	7	0	2	5	0	3.142	6	1	1
15	6	0	6	1	6	1	5	1	1	3.142	5	2	2
16	2	0	4	3	4	3	3	2	2	2.571	3	3	1
17	2	2	5	0	5	0	5	0	0	3.406	4	6	0
18	0	2	3	2	3	2	1	1	3	1.800	3	6	0
19	1	0	1	6	6	1	0	0	7	1.000	2	6	1
20	3	1	5	1	5	1	4	1	1	3.500	2	8	0
21	9	0	7	0	7	0	6	1	0	3.857	6	2	0
22	0	0	2	5	3	4	0	2	5	1.571	3	2	2
23	0	0	4	3	6	1	0	5	2	2.285	4	0	1
24	1	0	5	2	5	2	2	3	2	2.571	7	3	0
25	3	0	5	2	6	1	3	1	3	2.428	3	5	0
26	0	1	6	0	6	0	0	5	1	2.166	2	7	0

ID	45	46	47	48	49	50	51	52	53	54	55	56	57
27	0	0	1	6	4	3	0	1	6	1.287	2	6	1
28	0	0	3	4	5	2	1	1	5	1.666	6	0	1
29	0	0	3	4	5	2	1	3	3	2.000	1	0	0
30	1	0	5	2	7	1	2	2	3	2.142	3	2	2
31	1	0	3	4	5	2	0	4	3	1.857	4	5	0
32	4	2	5	0	4	1	4	0	1	2.857	6	4	0
33	4	0	7	0	7	0	5	2	0	3.285	7	0	3
34	1	0	3	4	7	0	0	2	5	1.428	6	4	0
35	4	0	7	0	7	0	3	4	0	3.285	4	1	2
36	3	0	4	3	6	1	0	5	2	2.142	6	2	1
37	5	0	5	2	6	1	2	4	1	3.428	5	1	1
38	0	1	5	1	5	1	2	3	1	2.833	3	0	0
39	2	0	5	2	6	1	3	1	3	2.428	5	2	2
40	2	0	5	2	7	0	1	1	5	1.714	4	2	3
41	1	0	6	1	7	0	5	2	0	3.142	1	2	3
42	6	0	7	0	7	0	6	1	0	3.857	7	1	2
43	4	0	5	2	7	0	3	3	1	3.000	7	3	0
44	0	0	4	3	6	1	4	2	1	3.142	4	1	4
45	5	0	6	1	6	1	4	3	0	3.142	9	0	0
46	0	0	2	5	6	1	1	1	5	1.428	9	1	0
47	2	2	5	0	5	0	1	4	0	3.200	3	3	1
48	7	0	7	0	7	0	4	3	0	3.571	5	4	1
49	2	0	7	0	6	1	4	1	2	2.571	2	7	1
50	4	0	6	1	7	0	3	4	0	3.000	8	1	0

ID	45	46	47	48	49	50	51	52	53	54	55	56	57
51	7	0	7	0	7	0	6	1	0	3.571	6	3	1
52	1	0	7	0	6	1	2	5	0	3.000	6	1	0
53	5	0	7	0	7	0	5	2	3	3.571	9	0	0
54	1	0	4	3	6	1	1	2	4	2.142	2	8	0
55	0	1	6	0	6	0	2	4	0	2.666	7	1	2
56	0	3	3	1	4	0	1	2	1	2.740	1	6	2
57	6	0	7	0	7	0	6	1	0	3.428	7	1	0
58	2	0	5	2	7	0	3	2	2	2.857	3	5	1
59	7	0	6	1	6	1	4	2	1	3.428	6	3	0
60	-	-	-	-	-	-	-	-	-	-	-	-	-
61	2	0	5	2	6	1	3	3	1	2.571	4	2	2
62	4	0	7	0	7	0	5	2	0	3.714	7	1	1
63	2	1	3	3.	4	2	2	1	3	1.833	3	6	0
64	-	-	-	-	-	-	-	-	-	-	-	-	-
65	1	0	3	4	3	4	2	0	5	1.571	5	4	1
66	1	1	5	1	5	1	2	3	1	3.166	3	6	1
67	7	0	7	0	7	0	5	2	0	3.710	6	2	0
68	1	2	5	0	5	0	1	3	3	2.285	3	6	1
69	3	0	7	0	7	0	5	1	1	3.285	9	0	0
70	1	0	6	1	5	2	2	4	1	2.428	5	3	2
71	2	0	2	5	5	2	1	1	5	1.714	2	6	2
72	0	0	3	4	6	1	1	1	5	1.857	3	2	2
73	0	1	0	6	3	3	0	0	6	1.000	4	6	0
74	4	0	6	1	7	0	5	1	1	3.428	5	1	1
75	0	0	1	6	4	3	0	2	5	1.285	0	10	0

RAW SCORES

ID	58	59	60	61	62	63	64	65	66	67	68	69	70
1	4	4	0	17	2	4	4	10	13	12	1	1	1
2	1	5	0	19	5	6	1	12	9	5	4	0	0
3	3	8	0	5	8	6	4	18	17	17	0	0	0
4	3	6	0	15	4	0	4	8	17	16	1	0	0
5	2	6	0	14	6	4	4	14	12	10	2	0	0
6	1	7	0	11	6	4	2	12	17	14	2	1	0
7	0	3	0	18	3	4	0	7	15	13	1	1	0
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1	7	0	12	5	5	1	11	17	8	9	0	0
10	2	5	0	13	4	3	3	10	17	15	2	0	0
11	1	4	0	21	4	3	1	8	11	5	6	0	0
12	1	6	0	10	7	3	1	11	19	18	1	0	0
13	0	8	0	5	11	2	3	16	19	16	3	0	0
14	2	4	0	14	4	5	3	12	14	12	1	0	1
15	1	5	0	19	3	5	1	9	12	10	2	0	0
16	3	7	0	9	7	3	4	14	17	15	2	0	0
17	0	6	0	16	8	3	0	11	13	13	0	0	0
18	0	6	1	8	9	2	0	11	21	19	2	0	0
19	1	8	0	9	8	2	1	11	20	20	0	0	0
20	0	8	0	10	10	0	1	11	19	14	3	2	0
21	2	4	0	17	3	6	2	11	12	11	1	0	0
22	3	7	0	8	5	5	4	14	18	16	2	0	0
23	5	6	0	10	2	3	6	11	19	18	1	0	0
24	0	3	0	18	10	1	0	11	11	9	2	0	0
25	2	7	0	10	11	0	2	13	17	13	1	1	2
26	1	8	0	8	11	3	1	15	17	16	1	0	0

ID	58	59	60	61	62	63	64	65	66	67	68	69	70
27	0	7	1	4	10	2	1	13	23	19	4	0	0
28	3	4	0	15	3	2	4	9	16	14	2	0	0
29	0	10	0	4	18	1	0	19	17	16	0	1	0
30	3	7	0	14	3	3	4	10	16	14	2	0	0
31	1	6	0	10	10	2	1	13	17	17	0	0	0
32	0	4	0	13	7	2	1	10	17	16	0	0	1
33	0	3	0	18	1	9	0	10	12	11	1	0	0
34	0	4	0	18	4	3	0	7	15	12	2	1	0
35	3	6	0	13	3	5	3	11	16	14	0	2	0
36	1	4	0	16	8	3	1	12	12	10	2	0	0
37	3	5	0	22	3	3	3	9	9	8	1	0	0
38	7	7	0	12	4	1	7	12	16	11	2	0	3
39	1	5	0	10	4	3	4	11	19	17	2	0	0
40	1	6	0	12	3	5	1	9	19	18	1	0	0
41	4	9	0	9	5	7	4	16	15	15	0	0	0
42	0	3	0	18	2	4	1	7	15	13	2	0	0
43	0	3	0	13	7	3	1	11	16	15	1	0	0
44	1	6	0	13	2	6	1	9	18	15	3	0	0
45	1	1	0	20	2	0	1	3	17	11	6	0	0
46	0	1	0	19	5	3	1	9	12	5	6	0	1
47	3	7	0	9	5	6	3	14	17	15	2	0	0
48	0	5	0	14	9	5	0	14	12	9	2	0	1
49	0	8	0	9	9	3	1	13	18	15	2	1	0
50	1	2	0	20	3	2	1	6	14	12	2	0	0

ID	58	59	60	61	62	63	54	65	66	67	68	69	70
51	0	4	0	19	5	5	0	9	11	7	2	1	1
52	3	4	0	19	3	2	3	8	13	8	4	1	0
53	1	1	0	21	3	4	1	8	11	11	0	0	0
54	0	8	0	6	11	3	1	15	19	13	3	3	0
55	0	3	0	18	1	5	0	6	16	14	2	0	0
56	0	8	1	7	8	3	2	13	20	17	2	1	0
57	2	3	0	16	5	3	2	10	14	8	2	1	3
58	1	7	0	8	7	3	1	11	21	20	1	0	0
59	1	4	0	18	3	4	2	9	13	8	4	0	1
60	-	-	-	-	-	-	-	-	-	-	-	-	-
61	2	6	0	11	5	5	2	12	17	14	3	0	0
62	1	3	0	15	5	2	1	8	17	17	0	0	0
63	1	7	0	10	9	0	1	10	20	16	3	0	1
64	-	-	-	-	-	-	-	-	-	-	-	-	-
65	0	5	0	12	12	3	1	16	12	9	3	0	0
66	0	7	0	12	9	3	0	12	16	16	0	0	0
67	1	3	1	16	2	5	3	10	14	10	3	0	1
68	0	7	0	14	9	3	0	12	14	9	3	0	2
69	1	1	0	20	1	3	1	5	15	12	3	0	0
70	0	5	0	14	6	4	0	10	16	13	3	0	0
71	0	8	0	12	7	6	0	13	15	12	3	0	0
72	3	7	0	8	3	7	3	13	19	18	1	0	0
73	0	6	0	10	9	3	0	12	18	18	0	0	0
74	3	5	0	20	3	5	4	12	8	2	4	0	2
75	0	10	0	1	14	5	0	19	20	19	1	0	0