CHANGES IN CONCEPTUAL BEHAVIOR IN SCHOOL CHILDREN AS A FUNCTION OF CHRONOLOGICAL AGE

A thesis

Presented to

the Faculty of the Department of Psychology

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In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

---

by

Walter Penk

June, 1964

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Abstract

A developmental analysis of age changes in several dimensions of children's conceptualizations was conducted. Initially, it was hypothesized that, as children increased in age, they would increasingly reflect the effects of enculturation. Secondly, it was predicted that children would shift in levels of abstraction, changing from global, diffuse concepts in the younger years, to highly articulated, differentiated concepts in the intermediate years, to highly integrated concepts in the older years. Thirdly, it was hypothesized that there would be unspecified sex differences in these dimensions.

Seventy subjects, ages six, eight, ten, twelve, and fourteen, from grades one, three, five, seven, and nine, were each administered an object-sorting test and an intelligence test. The fourteen subjects in each of the five age-grade groups did not differ significantly in intelligence ratings. Their sortings were scored in terms of "conceptual area analysis," "incomplete conceptual transactions," and "culturally-reinforced concepts," as outlined by McGaughran (1954, 1963), and elaborated in later research. These scoring systems provided a multivariable,

"conceptual area" analysis on the basis of which the first hypothesis could be tested along a "public-private" continuum (which serves as a measure of social agreement), and an "open-closed" continuum (which furnishes a measure of level of abstraction).

Three of the four predicted measures supported the first hypothesis. The "public" measure did not follow the gradual linear rise with age. All of the measures supported the second hypothesis of a curvilinear relationship between age and level of abstraction. Sex differences were found in these measures; however, no attempt was made to generalize these findings, pending replication.

Generally, the conclusions of the study were that conceptual area measures are sufficiently sensitive to reveal changes with age in the two dimensions of conceptual behavior. The broader "total" scores (i.e., open and public) however, are probably less useful than the specific CA, ICT, and CR categories in describing these age changes.

A program for further research was briefly outlined, with particular attention given to the role of intelligence, detailed analysis of conceptual changes in the intermediate years, and the need for the establishment of additional behavioral referents.

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CHAPTER ONE

The Problem

In descriptive analyses of children's conceptual behavior, two broadly defined characteristics generally have been isolated in a wide variety of developmental experiments and theories.

First, it has been frequently observed that children's concepts reflect the effects of increasing enculturation, or socialization, as a function of increasing age. Accompanying age changes, there has been noted a progressive shift in conceptualization away from subjective categories toward a gradually increasing intersubjectivity of coded experience. As children grow older, they have been characterized as evidencing uniform increases in the sharing of commonly-accepted, cultural concepts.

Age changes in children along a second dimension of conceptual behavior have been identified as changes in level of abstraction. With increasing age, children have been described as demonstrating growth in the ability to form concepts on the basis of "essential" features of objects or events; correspondingly, they have shown a gradually developing resistance to per-

ceptually prominent but irrelevant characteristics of on-going experience. Generally, younger children's concepts have been tied to situational or contextual circumstances. Older children have been characterized as more capable of higher levels of abstraction; they are able to isolate properties common to an ever-increasing diversity of objects or events, present or absent.

The analysis of these two general characteristics of children's thinking has been incorporated within several theoretical explanations of conceptual development. However, the specific terminology employed has varied considerably; generally, differences in terminology reflect differences among theorists in their over-all frames of reference.

In Werner's orthogenetic rationale, changes in level of socialization and abstraction are interpreted as changes in "genetic level," based on an "organic point of view." Conceptual development is seen as illustrative of a fundamental law of genetic development, namely "...increases of differentiation and hierarchic integration" (Werner, 1948, p.44). Werner uses polarized concepts to denote changes consonant with this general principle of "organic development" (e.g., he refers to shifts from "syncretic" to "discrete" and from "diffuse" to

"articulated" in characterizing developmental changes in levels of abstraction).

Like Werner, Piaget (1930) also describes the process of development in children's thinking in terms of observable changes in socialization and abstraction levels. He visualizes conceptual growth as evolving through different developmental stages, but prefers the language of formal logical operations to describe his findings (e.g., "logic of relations," "logic of classes," "conjunction", etc.). Socialization of concepts occurs when the child shifts from centering (in his idiosyncratic point of view) to decentering (taking the social role of another). For observed changes in level of abstraction, Piaget employs such constructs as changes in "schemata" and "transitivity".

Other investigators (Cameron, Goldstein and Scheerer) have used different descriptive and theoretical systems to describe or to "explain" the development of conceptual behavior in terms of two commonly-agreed-upon fundamental growth processes. First, as the child develops, he is increasingly able (or inclined) to follow cultural rules (concerning the equivalence or non-equivalence of events) in his conceptual behavior. Second, the range of equivalence (or level of

abstraction) of his concepts changes in predictable ways with increase in chronological age.

Despite quite a bit of apparent overlap between theories and between experimental results in the area of conceptual development, attempts to interpret and to measure the growing effects of enculturation and shifts in the level of abstraction have met with uneven success. Several factors have contributed to problems in measurement and interpretation. There has been an inconsistent use of terminology from one experiment to another. Many different theoretical terms have been introduced to apply to essentially the same processes; sometimes these terms have seemed to be intended to shape the data, rather than visa versa. Frequently, there has been a failure to empirically derive constructs from observations, resulting in terminology without behavioral referents. Finally, the investigations have often lacked standardized experimental procedures.

One promising approach which has overcome these deficiencies to some extent is "conceptual area analysis" devised by McGaughran (1954) and elaborated in later research (McGaughran and Moran, 1956b). These authors have provided an empirically-based rationale for measuring the effects of enculturation and

levels of abstraction.

The experimental procedures have been standardized through use of the Rapaport (1944) modification of the Object Sorting test. The terminology used is closely related to the measuring operations. A relatively successful history of identifying predicted group differences has been reported in the literature.

The purposes of this present research are to provide an empirical demonstration of the progressive increase in socialization and the shifts in abstracting levels among elementary school children. Conceptual area (CA) analysis is used as a measuring procedure to attempt to bring some clarification to the confusion in conflicting terminology and rationales.

An earlier study (Griffith, 1957) had shown that McGaughran's scoring system could be applied to the behaviors of children. The hypothesis was confirmed that the CA measure of "order of conceptual classification" would delineate the shifts in the levels of abstraction. The study failed to confirm the hypothesis of a progressive linear increase in socialization with age as shown by a measure of "extent of social agreement." Griffith interpreted the failure of this hypothesis to result from his use of age groups differing significantly in intelligence.

This present investigation was undertaken with groups which did not differ in intelligence. Two additional scoring systems, representing refinements of CA analysis, were included to help test three major hypotheses:

First, it was hypothesized that the progressive increase in socialization would be shown by a positively-accelerated, linear increase in McGaughran's social agreement measures among subjects in increasing age groups.

Second, it was hypothesized that shifts in the levels of abstraction associated with age changes would indicate a curvilinear relationship, as manifested in the order of conceptual classification scores.

Third, it was hypothesized that there would be significant differences between sexes of similar ages in the CA measures of socialization and abstraction level.

CHAPTER TWO

Background and Review of the Literature

Enculturation as a Determinant of Conceptual Behavior

The term "enculturation" quite generally refers to the cumulative effects of imposing cultural or sub-cultural behavior patterns upon new members of a social group (in this case, patterns of conceptualization imposed upon children). None of the theorists discussed in this section has used this specific term to describe the course of conceptual development in children. However, each has introduced terminology which seems to convey the basic meaning of this more neutral, descriptive term, although, in most cases, the terminology employed has had additional theoretical implications.

Werner (1948, 1957) has been one of several theorists to consider a process like enculturation as an important determinant in the cognitive development of children. He has employed a variety of measures to define operationally level of socialization in terms of level of attainment a child reaches in some "cognitive" task. For example, in groups of six- through twelve-year-old children of average intelligence, he found a steady increase in the number of mosaic patterns which could be

completed "correctly" on a marble-board (Werner, 1950). In his study of children's conceptions of causal relationships, an increasing frequency of "causal conjunctions" was found accompanying age level increases (Werner, 1957). When deciphering the meaning of an artificial word from its use in six different contexts, older children generally attained more correct answers than younger children (Werner and Kaplan, 1950). From these studies, Werner concluded that younger children's thought processes were less socialized (i.e., "subjective," "ego-morphic," and "autistic"). With age, there was "...an increasing adaptation of thought to objective fact" (Werner, 1957, p. 319).

Cameron (1938, 1939) has described an increasing "impact of social effects" with age in his examination of children's drawings ("graphic symbolization"). His basic measure was the correctness, or complexity, with which children drew human figures. Similar to Werner, he concluded that:

> Conceptual symbolization with its multiplicity of potential directions undergoes progressive organization toward maturity of the individual and tends to contract, in so doing, from the immature cluster of the child to the mature integrate (Cameron, 1938, p. 172).

Piaget has written extensively of increasing socialization associated with chronological age changes. He proposed two distinct categories to describe changes in children's language

behavior: (1) ego-centric speech, in which the role of the hearer was not taken into consideration by the speaker; and (2) socialized speech, in which the child communicated with another person by assuming a societal role (through commands, requests, etc.). Younger children used ego-centric speech, whereas older children's language was labelled as "socialized" (Piaget, 1926). One of his more direct statements concerning increasing enculturation can be found in his discussion of the terms centering-decentering in his study of children's conception of causality. According to his interpretation, younger children cannot adopt the viewpoint of another person and, accordingly, remain "centered" in their highly personal world. Older children can "decenter;" that is, learn something of others' points of view by being able to assume their social roles. Only when a child can decenter is he able to attain some degree of consensual validation in his cultural surroundings.

> For the construction of the objective world and the elaboration of strict reasoning both consist in a gradual reduction of egocentricity in favour of the progressive socialization of thought, in favour, that is to say, of objectivation and reciprocity of viewpoint (Piaget, 1930, p. 301).

The gradual impact of culture upon children's concepts, then, has been observed by a number of investigators interested in the conceptual development of children. Thus, one could reasonably expect to find a progressive increase in culturally-

sanctioned conceptual forms in children as a function of chronological age.

Levels of Abstraction in Conceptual Behavior

Levels of abstraction have been the second descriptive dimension receiving much attention in studies of children's thinking. Generally, the term refers to the degree of restrictiveness involved in the boundaries of a concept. A concept is less restricted (or is higher in abstraction level) as more and more objects or events are responded to as if they are equivalent. Correspondingly, a concept is more restricted (or is lower in abstraction level) when fewer and fewer objects or events are responded to as if they are equivalent.

Several theorists have discussed changes in level of abstraction in children with a variety of terminologies. Werner (1957) has observed that pre-school children between ages four and six use "global," "diffuse," and "labile" concepts. Slightly older children (roughly seven- to eight-years-old), employ highly differentiated concepts. Older children (ages nine and above) have a well-integrated, relatively unrestricted, hierarchically-organized system of conceptualization.

He refers to shifts in restrictiveness as "...the abstracting process of the orthogenetic principle," in which "abstracting" is defined as the means by which "...parts of a unit are

detached from the whole, and separate qualities -- color, form, etc., -- are experienced in isolation" (Werner, 1957, p. 234). Concerning "whole-part" relationships in children's thinking, Werner concludes that levels of abstraction change with age from: (1) a broad, highly undifferentiated range of equivalence; to (2) a more mature order involving many differentiations made with specifically-defining articulations; to (3) the most mature order of hierarchic integrations (i.e., a broader equivalence range with relevant subordinations).

This general approach has also been applied in a developmental analysis of children's Rorschach behavior. Using the "area" scores (i.e., whole, detail, and small detail responses), Hemmendinger (1960) reported:

> With increasing age there is a decrease of the undifferentiated, diffuse whole and detail responses, and an interesting shift from the early whole responses toward small details between the ages of six and eight years, then declining in favor of the integrated whole responses later on" (Hemmendinger, 1960, p. 64).

Piaget also has noted shifts in the levels of abstraction, developing from diffuseness to a high degree of integration with advancing age. He prefers to characterize these changes in terms of "stages," believing that there are totally different processes involved as children shift from one stage to another. For the diffuse, less restricted concepts of the early years, he speaks of "syncretic" thinking. This unique type of thinking,

which predominates in the "preoperational subperiod," functions in such a way that "...a multitude of diverse things are inchoately but intimately co-related within a global, all-encompassing schema" (Flavell, 1963, p. 160).

For the highly differentiated concepts of the middle childhood years, Piaget employs the term "concrete operations" to delineate the restrictiveness of the children's concepts.

> The various concrete-operational systems (e.g., the logical groupings) exist more or less as separate islets of organization during the 7- to 11-year period; they do not interlock to form a simple, integrated system" (Flavell, 1963, p. 204).

For the highly integrative, less restricted conceptualization of the later childhood years, Piaget assigns the term "formal operations." In this stage, concepts are not only integrated within a formal, cognitive system, but the child is free to extend the realm of the concept beyond the limits of prior experience. No longer is he limited to "realness" at the time of categorization, but can conceptualize on the basis of an "as if" set. In order to shift from <u>what is</u> to <u>what might be</u> the child, Piaget hypothesizes, must have developed a hierarchically-integrated system of thought. According to this theory, only a child older than eleven years can achieve this level.

From these observational comments of directional development in children's levels of abstraction, one would expect to

find that (in somewhat more general terms) younger children lack firmly differentiated boundaries between concepts. While these concepts would be at a high level of abstraction, conceptual organization would be extremely global and diffuse. In the middle childhood years, children's concepts should be characterized by a restricted categorization of object characteristics. The highly differentiated concepts of this age group would consist of narrow equivalence ranges, or low levels of abstraction. In later childhood, one would expect concepts to be more highly integrated and less restricted; equivalence would be based upon abstracted attributes of a greater range of events and objects. While these concepts would be of a relatively high level of abstraction, they would be distinguished by their greater consistency, integration, and systematization.

Sex Differences in Cognitive Behaviors

Anastasi (1958) has cited a number of experiments reporting sex differences in aptitudes and personality characteristics. Most of these findings were judged as reflecting differences in "...the traditional sex roles of our culture" (Anastasi, 1958, p. 497).

Caron and Wallach (1959) have reported findings more

directly related to sex differences in conceptual development. These investigators used cognitive measures with a sample of fifth-grade children. They found that "conservatism," as measured by restrictiveness in conceptual breadth, was more characteristic of girls than boys.

Recently, Kagan and Moss (1962) studied sex differences in a longitudinal investigation. The authors concluded that differences in such behavioral traits as "passivity," "aggression," "achievement and recognition" were associated with sex differences in conceptual styles.

While neither sufficient data nor adequate theories exist to predict the exact direction of sex differences in conceptual behaviors, it is a reasonable expectancy that sex differences would be found in other measures of conceptualization (in this case, measures of developmental changes in the effects of enculturation and conceptual level).

Interim Conclusions

While these two descriptive variables -- enculturation effects and levels of abstraction -- have clearly figured in both research and theory concerning developmental changes in conceptualization, the fit between findings and interpretation has not always been completely clear.

The lack of a well-defined, univocal set of constructs in

this area has resulted in the introduction of a number of loosely-defined terms without adequate behavioral referents that have been variously used from study to study and from theory to theory. Perhaps most representative of these inadequately defined constructs is the term "concrete" as applied to thinking or categorization. Goldstein's dichotomy of abstract-concrete was originally proposed to account for the specific conceptual deficits found in brain-damaged patients as compared with normal adults; the application of these terms in this particular context has frequently led to reliable and useful distinctions. But the subsequent use of the term "concrete" to characterize the conceptual behavior of schizophrenics, children, and non-literate cultural groups has led to an enormous amount of semantic confusion.

When Goldstein and Scheerer (1941) concluded that children could achieve only the "concrete attitude," they referred to a complete inability of the child to break perceptual wholes into their component parts. "Concrete" thinking children, as contrasted with the active independence of the abstract attitude achievable by adults, was characterized as passive; thus, children are bound to immediate experience, their actions determined solely by the objects and/or the situation.

However, Piaget has characterized a similar process

("concrete operations") in children of similar age groups, as manifesting the existence of a definite cognitive structure that has been "internalized." This internalized schema allows the child to analyze the totality of immediate experience into its component parts. Accordingly, the Goldstein-Scheerer "concrete" child would be wholly "passive" in his thinking, whereas the Piaget "concrete" child would be "actively" categorizing.

To further complicate the meaning of the term "concrete", Werner describes the conceptualizations of children at this age as "concrete abstractions". While the Goldstein-Scheerer child would be "passive" and the Piaget child "active", the Werner child is both "active" and "passive" in conceptualization -- simultaneously. Obviously, the lack of clear behavioral referents for the over-worked term, concrete, has led to confusion.

In most cases, the terminology employed in interpreting the course of conceptual development has been taken from other explanatory rationales and, on an <u>a priori</u> basis, this rationale has apparently been assumed to be applicable to descriptions of children's thinking. A case in point is the classification system of Piaget; he has adopted the structure of symbolic logic and has tried to shape observations to fit

the scheme. As a result, much of the terminology has not been tied in with operational procedures (Lunzer, 1960). A similar point of criticism has been raised by McGaughran (1954) in his history of the failure to provide operational definitions for the terms "concrete" and "abstract."

In addition, there has been frequently a lack of standardized experimental procedures. Much of the data still is obtained in the form of protocol reporting such things as the observations of a skilled investigator who watches his child playing with his watch and reports what happens when the watch is suddenly removed. Some investigators continue to rely upon inadequately-reported clinical observational methods, thus complicating efforts of replications or further investigations.

These kinds of deficiencies have resulted in a number of disagreements in interpretation. A classic conflict has been the controversy in which some observers have preferred to typify age changes in conceptual behavior as following a continuous pattern, while others are convinced that this behavior follows a discontinuous, or stage-by-stage, course.

"Conceptual Area Analysis" Rationale

One promising approach which has overcome these difficulties to an extent is the "conceptual area (CA) analysis" devised by McGaughran (1954) and elaborated in later research

(McGaughran and Moran, 1956). Included in this multivariable formulation is a set of constructs by which developmental changes in the effects of enculturation and levels of abstraction could be measured more meaningfully.

This analysis is based on a scoring system developed for use with the Rapaport modification of the Goldstein-Gelb-Weigl-Scheerer Object Sorting test (Bolles, 1937; Goldstein and Scheerer, 1941; and Rapaport, 1944). It involves quantifying conceptual responses along two co-ordinated dimensions. The first of these, termed amount of social agreement, "...describes the extent to which an individual concept permits the potential public prediction of conceptual-group limits" (McGaughran, 1954, p. 184). In investigations of children's conceptualization, this dimension would appear to measure the effects of enculturation, in terms of how freely a child's concept is shared and understood by other members of his culture. The second dimension, order (or degree) of conceptual classification, "...describes the extent to which an individual concept permits the potential inclusion of additional conceptual-group-memberships within its limits" (McGaughran, 1954, p. 184). This dimension corresponds with "levels of abstraction" (as discussed above); emphasis is placed upon the relative restrictiveness in the equivalence range of concepts.

Extent of social agreement is measured along a "public-

private" continuum. This continuum is used to assess the degree to which "...the principle underlying the grouping is widely shared by and freely communicated to others within a social group" (McGaughran and Moran, 1957, p. 45). For example, if a child responded equivalently to all domesticated, four-legged, furry animals that run, and bark, and called them "dogs", his conceptual limits would be relatively predictable, and his concept of "dogs" would be termed "public." However, if a child named and responded only to some of the animals cited above as "dogs", while at the same time assigning the concept "dog" to some feathered, two-legged things that fly, and all long, no-legged things that crawl, the limits of his concepts would be less predictable, less "public." This latter principle of equivalence is not freely communicated under current cultural conditions, and, hence, would be called "private".

Order of conceptual classification is measured along an "open-closed" continuum. This measure is based upon "...the number of attributes which are used, or implied, in each conceptual definition" (McGaughran and Moran, 1956, p. 45). If a child consistently responded equivalently to all brown, furry, blue-eyed, barking, four-legged animals as "dogs", but did not respond equivalently to other canines that were black, gray, or not barking, his conceptual groupings would be more restricted, or "closed." A relatively higher number of

attributes was employed in conceptualizing the animals as equivalent. Had the child "abstracted" the collection of attributes to include only very general similarity of anatomical features as the basis for his concept of "dog," he would have been relatively more "open," i.e., capable of responding equivalently to a broader range of animal sub-specie.

If these two dimensions--"open-closed" and "public-private"--are visualized as two continua which intersect (cross-like) in space, four quadrants, or "conceptual areas," result. In the McGaughran-Moran scoring system, each conceptual grouping is assigned to one of four "conceptual areas:" (1) closed-public; (2) open-public; (3) open-private; and (4) closed-private.

By using "conceptual area analysis," McGaughran's approach differs considerably from previous studies that have employed conceptual <u>levels</u> of attainment measures (e.g., Reichard, Schneider, and Rapaport, 1944; Welch and Long, 1940; and Werner and Kaplan, 1950). Whereas previous experiments classified conceptual responses on the basis of one continuum (actually a dichotomy), McGaughran classifies concepts by locating them in a space common to two continua. Accordingly, McGaughran's rationale has differed from previous research through its emphasis upon a multivariable analysis.

Conceptual Area Analysis Investigations

Research in conceptual area analysis (CA) has resulted in the successful prediction of a variety of behaviors related to different forms of conceptual groupings. In the initial CA research, McGaughran (1954) separated two groups of college students, according to whether they were predominantly (a) closed-public, or (b) open-private in their sortings. On the basis of these two CA distinctions, he successfully predicted differences in the language behavior of the subjects (obtained from recorded TAT stories). The students who primarily employed closed-public responses were more "stimulus bound," rigid, inhibited, and passive in their stories. They contrasted significantly with the open-private students who told more fluid, spontaneous, autonomous stories. Further, the conceptual area approach did differentiate between the two groups, whereas a conceptual level analysis (classifying the students' sortings as either "concrete" or abstract) would not have produced this differentiation because both groups would have been necessarily classified as "concrete" in their conceptual performance.

In a second study, testing whether interferences in the thought processes of "paranoid schizophrenic" subjects more frequently accompanied (a) a loss of abstracting ability, or (b) social disarticulation, McGaughran and Moran (1956b) clearly sup-

ported the Cameron hypothesis that the source of difficulty was a disorder in social communication. Accordingly, the social agreement dimension clearly depicted the loss of socially-shared concepts in the schizophrenic sample. In addition, the study contrasted a conceptual level scoring system with conceptual area analysis. Only the multivariable CA approach clearly delineated differences between experimental and control groups.

McGaughran and Moran (1957) distinguished the performance of "brain-damaged" and "schizophrenic" groups in terms of order of conceptual classification. While both groups were comparable in terms of social agreement, the brain-damaged subjects employed highly restricted concepts, with the under-abstracting, closed-private and closed-public sortings predominating. The schizophrenic subjects over-abstracted, primarily using open-private sortings. These results provided a persuasive demonstration of the empirical basis of the order of conceptual classification dimension. The conceptual performance of the brain-damaged subjects was characterized as "reality fixing." The schizophrenic patients were described as showing "autism," a "personal idiom," and "loss of reality testing."

These findings have been replicated (Leventhal, McGaughran, and Moran, 1959), thus showing consistency of the results in a new sample. Additionally, it was demonstrated "...that individuals evidenced a consistent tendency to operate within a specific

quadrant in responding to a variety of conceptual tasks" (Moran, McGaughran, and Leventhal, 1957, p. 194). Thus, the behaviors associated with CA analysis "...seem to warrant the conclusion that intra-individual consistency in conceptual-area performance is sufficient to merit the term 'conceptual trait'" (Moran, McGaughran, and Leventhal, 1957, p. 196).

Other investigators have successfully applied the CA scoring system to adult and adolescent samples. "Mental retardates," as predicted, were found to be unusually restricted in order of conceptualization (Iscoe and Giller, 1959). Further, mental retardates were found to achieve a cluster of scores differing from either "schizophrenic" or "brain-damaged" samples. Silverstein and Mohan (1963) described their mentally retarded subjects as "doubly concrete"; their scores fell clearly within the closed-private quadrant. In describing the performance of "schizophrenic" and "psychoneurotic" groups, Silverman and Silverman (1962) reported that the CA scores of adolescent "schizophrenics" were significantly more private than the performance of "neurotic psychopathic deviate disorders."

In summary, McGaughran's system of CA analysis has provided more specifically-defined measures for the two commonly-observed occurrences in the development of children's representational behaviors: increases in enculturation and changes along a dimension

of abstraction levels. In applying this approach to the object-sorting behavior of children, one would expect to demonstrate increases in frequency of usage of socially-shared concepts and shifts in order of conceptual classification.

CA Analysis Research of Children's Conceptual Behaviors

Two studies have provided preliminary data about CA scores of children from varying age groups. Wylie (1957) compared the object-sorting and Rorschach behaviors of children aged three, four, and five. He directly assessed the differences in effectiveness between a discontinuity theory of development in children's thinking (as exemplified by Klopfer's Rorschach scoring system for which it is posited there are qualitatively different stages in children's perceptual development) and a continuity theory in which children's thinking is viewed as developing in a linear fashion (as measured by CA analysis and an additional refined scoring system for "incomplete conceptual transactions").

Because the Rorschach analysis was a significantly poorer predictor of age differences (particularly failing to distinguish the four-year-old subjects' responses from the responses of the subjects aged three and five), Wylie concluded that the success of the CA and incomplete conceptual transaction (ICT) analyses "...would seem to provide relatively strong support for the assumption of progressive linearity as opposed to qualitative distinctiveness

in the conceptual development of children in the age groups studied" (Wylie, 1957, p. 85). The results obtained with CA and ICT scoring systems indicated that all changes with age followed hypothesized directions, and that these developmental changes were linear in form.

In the second application of CA analysis to children's sorting behavior, Griffith (1957) predicted that there would be a positive linear relationship between age increases and amount of social agreement. Additionally, he predicted a curvilinear relationship between age increase and order of conceptualization. For the second prediction, it was hypothesized that, for the five groups of five- , seven- , nine- , eleven- , and thirteen-year-old children, the youngest and oldest subjects in his sample would use more open concepts in their conceptual groupings than would the intermedially-aged children.

Griffith confirmed the curvilinear relationship between age and frequency of open concepts. However, his prediction for the positively-accelerated linear rise in public concepts was not clearly supported. Contrary to the general hypothesis:

> a point of deviation from the expected linear rise in 'publicness' was found in the responses of the 7-yr. old group who gave more public responses than either 9- or 11-yr. old groups...This hypothesized relationship between frequency of public concepts and age was not obtained (Griffith, 1957, p.20).

One of the apparent difficulties with Griffith's study was

the failure to control for intelligence across the age groups. McGaughran and Moran (1956a) have previously noted the high degree of association between sorting behavior and intelligence, and have stressed the importance of equating adult groups on this variable (McGaughran and Moran, 1957). In Griffith's research, the mean intelligence of the seven-year-old group differed significantly from the other four age groups. This group, highest in intelligence, also had a significantly higher than expected average number of public concepts. While Wylie (1957) found no direct influence of intelligence upon CA performance in his preschool sample, Griffith concluded about his school age subjects "...that had the IQ of the several groups been equated, the results would have been more in line with the hypotheses" (Griffith, 1957, p. 32).

In summary, the CA scoring system has a history of successful applications to adult and adolescent samples. The results from the children's studies have followed predictions, with the exception of Griffith's research in which the public measure deviated from expectations. Generally, McGaughran's multivariable approach would appear appropriate for an area of research which has lacked consistent terminology, measurement and rationale.

CHAPTER THREE

Procedure

Subjects

In exploration of developmental changes along two dimensions of conceptual behavior, seventy children were administered an object-sorting task and an intelligence test. There were seven boys and seven girls in each of the following five age groups: (1) six-year-old first-graders; (2) eight-year-old third-graders; (3) ten-year-old fifth-graders; (4) twelve-year-old seventh-graders; and (5) fourteen-year-old ninth-graders. Fifty-six subjects (80 per cent) were selected from several Lutheran parochial elementary and senior high schools in the Houston area. Fourteen subjects (one male and one female per age level) attended public elementary and junior high schools in Galena Park, Texas.

The average estimated intelligence for the total sample was 106.20. The age of the sample averaged around the half year for each of the five different age groups. Appendix A shows the age and intelligence means and standard deviations of the (a) male, (b) female, and (c) combined groups for each age level. For estimated intelligence, no significant dif-

ferences were found between the sexes within each age group; among the same sex subjects between each age group; or among combined male and female scores between each age group. The differences in age between the sexes did not reach significance within any of the age levels. A complete tabular presentation of the comparison of age and intelligence means is given in Appendix B of the paper.

None of the children had a recorded history of psychological evaluation or psychiatric diagnosis. The subjects, in approaching solutions to their everyday problems in living, had not been considered "deviant" by their teachers, school administrators, or various relevant community agencies.

Selection of subjects was made on a more-or-less random basis within the defined age groups. School test and performance records were used as general aids in obtaining a population normally distributed in intelligence.

Apparatus

Level of intelligence was estimated on the basis of the vocabulary subtest of the Wechsler Intelligence Scale for Children (1949). This procedure would appear to be justified because of the relatively high correlation of the vocabulary subtest with the Full Scale WISC intelligence scores. Product

moment correlations have been reported as ranging from .71 to .87 in age groups of seven-and-a-half, ten-and-a-half, and thirteen-and-a-half-year-old children (Wechsler, 1949).

The vocabulary subtest was administered and scored according to the directions specified in the manual (1949).

The object-sorting test (OST) was the Rapaport (1945) modification of the Goldstein-Gelb-Weigl-Scheerer Object Sorting test (1941). It involved 19 tasks in which everyday, household objects were sorted into groups "in which they belonged." In Part I, seven groupings were made under "active" conditions. A child stated why objects which he had selected and combined belonged together. Twelve "passive" groupings were made in Part II of the OST. Each child reported his reasons why examiner-grouped objects belonged together.

Thirty-four objects were available for sorting. Included were real and imitation sets of tools, silverware, smoking necessities, as well as two nails, two corks, two sugar cubes, a lock, a sink stopper, bell, and several pieces of paper. A detailed description of the objects is given in Appendix C of this paper. Essentially, these objects were similar to the types described by Rapaport (1945), and used by Griffith (1957), Wylie (1956), and others.

Each object has many physical attributes, and can be

sorted into any one of several categories according to various principles, such as color, function, form, material, or generic class. A round, red, paper circle could have been grouped with red, round, circular, or paper objects, as well as with objects upon which one could write.

Procedure

The administration of all tests was carried out in an office of the school each child attended. The OST was the first test administered in the two-part battery. After the name, age, birthdate, and grade level had been recorded, each child was asked to inspect the 34 objects and specify any object which was not recognized. After this period of familiarization, the OST was administered according to Rapaport's format and instructions (1945).

Formal OST administration began when the examiner asked a child to select one of the now familiar objects. When the child designated his choice, the examiner instructed, "Now pick out all those objects that belong with it. Tell me when you are finished." When the child said he was finished with his sorting, the examiner then asked, "Now why do they all belong together?" The examiner wrote the child's answer verbatim. In the six subsequent sortings of the "active" phase,

the examiner selected one object (according to Rapaport's pattern) and instructed, "Put with it all that belong with it. Tell me when you are finished." As the child completed each of the six sortings, the examiner asked, "Why do they all belong together?" Every answer was recorded. The twelve "passive" sortings in Part II followed this procedure: (1) the examiner sorted several objects according to the prescribed format; and (2) the child stated his principle of belongingness. The instructions were, "Now tell me why all these belong together." If the child failed to state a principle of belongingness, or if the child re-grouped only part of the objects, the instructions were repeated with "all" receiving additional emphasis.

The second part of the experimental test battery was administered immediately after the completion of the twelfth "passive" OST task. The examiner introduced the vocabulary subtest with the standardized introductory remarks. No change from prescribed procedures was undertaken.

Scoring

Three scoring systems were used: (1) conceptual area (CA) analysis; (2) an analysis of the incomplete conceptual transactions (ICT); and (3) an analysis of "culturally-reinforced

concepts (CR).

Conceptual area scoring. The CA scoring system has been outlined by McGaughran (1954) and detailed in later research (McGaughran and Moran, 1956a). He distinguished conceptual area analysis from previously-employed conceptual level in the following way:

> Classification by conceptual level represents an attempt to locate concepts at points along a single continuum; classification by conceptual area implies the use of two (or more) continua as coordinates to locate concepts within a space common to both (or to all) of them (McGaughran, 1954, p. 184).

The two continua used for CA scoring in this study are: (a) amount of social agreement; and (b) order of conceptual classification.

Each of these continua might be visualized as a line segment of a large plus sign. The vertical line could represent social agreement, ranging from an upper extreme of "publicness" to a lower extreme of "privateness". This dimension represented the ease, or lack of ease, with which a principle of belongingness could be shared or understood by others. The horizontal line could denote the order of conceptualization, ranging from a low order ("closed") to a high order ("open"). This dimension described the degree of restriction imposed by the sorting principle on the number of objects which could be included within the conceptual limits.

A principle of belongingness (or concept) was scored according to conceptual area analysis when it was located in a space within one of the four coordinated areas: (a) much social agreement (public) and a high order of conceptualization (open); (b) much social agreement (public) and a low order of conceptualization (closed); (c) little social agreement (private) and a high order of conceptualization (open); and (d) little social agreement (private) and a low order of conceptualization (closed).

The four CA scores used for this study, then, were: (a) open-public; (b) closed-public; (c) open-private; and (d) closed-private. By combining all open-public and closed-public sortings, the degree of publicness, or social agreement, could be obtained. When the open-public and open-private sortings were combined, a measure of openness was obtained. This latter combination of scores would provide a total measure of the order of conceptual classification.

A child's concept was assigned to the open-public (or metastatic--M) area when the principle of belongingness was freely communicated and of a high order of conceptualization. A typical M concept has openness when the number of common attributes among the objects is relatively few (e.g., five objects sharing the one single attribute "red", as contrasted

with sharing simultaneously several such attributes as redness, roundness, and rubberness). Further, the conceptual limits of the M response are more readily predicted (e.g., it would be easier to predict the limits of "paper" objects than the limits of objects that "smell exotically"). Generally, the M concept involves the abstraction of a single attribute, of abstraction or a superordination.

If a principle of belongingness includes a relatively high degree of publicness, but specifies several attributes common to all the sorted objects, the concept generally was categorized as a closed-public (Hypostatic--H) concept. Two objects belonging together "because they are nails" share several qualities in common (similarity of shape, color, and function) and the principle would be easily communicated in English-speaking cultures. H concepts include sortings on the basis of exact identity (two nails, etc.), specie identity (two forks, etc.), and failures to sort or state a principle of belongingness ("I don't know").

Private sortings involve concepts whose limits were difficult to specify. An open-private (or Autistatic--A) concept had boundaries which were difficult for an observer to set. Further, there is a minimal number of shared attributes among the objects. The most representative A concept is the loose,

representational sorting in which an object stimulates a stream of personal associations (e.g., the red paper circle may be seen as a plate or as the rising sun). Generally, an A score is given to responses which contain over-abstractions and lack social validation. For example, an observer would be hard pressed to delineate the boundaries of a concept grouping together all the red objects with the stated principle, "They're all forms of atoms." Considering that the other 29 objects also have molecular structures, it would be difficult to understand why these objects had not been included. When this kind of question was raised, the principle generally contains a private component. If, in addition, the order of conceptualization is relatively high, the response is scored A.

Concepts are scored within the closed-private (Iconistatic-I) quadrant when, in the sorting principle, the number of common attributes is relatively high, and the predictability of conceptual limits is obscure. The most common kind of I response is one including several closed concepts stated for a single sorting. An example would be the statement, "These belong together because they're nails and this is a wrench and this is a spoon," etc., as applied to the metallic objects in the passive phase. This "heterogeneous" concept lacks a unifying principle. Some of the available objects are grouped

together according to one kind of rationale and other objects were based on other principles. This kind of sorting has been described as "...a complete absence of a collecting principle..." (McGaughran and Moran, 1957, p. 48).

To aid in scoring, McGaughran and Moran (1956b) have written additional guidelines for CA analysis; these instructions appear in Appendix D. The following exceptions were made:

1. If a concept contained an M element plus others, the M element took precedence over any other scoring (A, H, or I) in that response. In previous studies (with adults), the non-M element has been assigned over M. When children gave several elements to one task, the most mature response (such as M) was scored.

2. If there were more than one CA element in any one sorting, each was separately scored, and this blend of elements was noted. However, if two or more elements were only A and I, then A took precedence over the I element; the I element was not scored, and a "blend" was not noted.

3. In the multi-CA scored concepts, or blends, the sequence was noted. If the initial response was scored A, and the second element was M, this sequence was considered to be "improved," or in the up direction. The blend direction was scored "down" if the sequence went from M and/or H to A and/or I.

The conceptual area measures consisted of the following: (a) open-public; (b) closed-public; (c) open-private; (d) closed-private; (e) open, or the sum of open-public and open-private concepts; and (f) public, or the sum of open-public and closed-public concepts. While not included in the results, the other CA measures were: (g) an "autistic index," composed of the open-private scores, plus ten, minus the closed-public responses; (h) blends of CA concepts; (i) "up" blends; and (j) "down" blends.

Scoring of incomplete conceptual transactions. A second scoring system was devised by McGaughran (1963). Called "incomplete conceptual transactions," or ICT, it allows for a refined definition of certain kinds of A, H, and I responses. A conceptual area sorting principle was also scored ICT when: (a) a child did not use (or used incorrectly) a denotative principle for an incorrect and/or a correct sorting; (b) the child categorized all the objects in the sorting on the basis of attributes applicable to only part of the group, or where objects were classified into several sub-groups within any one sorting; or, (c) a child refused to group objects in the "active" phase or refused to state a principle for sorted objects in the "passive" phase.

The misuse or non-use of a denotative principle, or

primitive conceptualization, would be illustrated by the principle, "...they all just look alike." given for a sorting of different tools. This classification was given to sortings that generally were the simplest, least mature attempts to group the objects.

The categorization of all objects in a task on the basis of characteristics of just a few of the objects is called confabulation. The response, "They're all things to eat with." for the sorting containing tools, silverware, and smoking utensils would be an example of a confabulatory principle. By comparison with primitive conceptualizations, these ICT sortings are judged to be more complex and more mature.

Once a sorting principle is designated as either a primitive or a confabulatory concept, it can be assigned to one of three sub-categories; extreme, moderate, or tendency. These three gradations are based upon the maturity of the concept within its particular ICT category. The more extreme a child's primitive principle, the further he is removed from employing a denotative principle (e.g., the simple, immature response, "I guess they just go together." -- for an unfamiliar grouping). A somewhat less extreme primitive concept (designated "moderate primitiveness") involves a more complex response. To illustrate, the child may group all red objects in the active phase,

and say, "They all look alike." In the least extreme of the primitive responses (a "primitive tendency"), the child approaches the full use of a correctly verbalized, denotative principle. For example, a child may group all of the red objects and say, "They're all gold."

Levels of maturity in confabulatory responses vary with the proportion of objects used to account for all of the objects in the sorting. "Extreme confabulatory" scoring is used when only two of the sorted objects are characterized to typify all of the objects. For the metallic objects (passive part), a child might say, "They're nails." The general scoring principle is that a few sorted objects account for the whole. Here, it is important that the child says nothing about the inapplicability of the undesignated objects in the sorting. A "moderate confabulation" is scored when more than two but not all of the objects serve as the basis for conceptualizing an entire group. An illustration would be the response to the grouping of toys (including toy tools) as "These are for working." "Confabulatory tendency" scores are assigned when <u>all</u> of the objects are sorted into two or more subgroups and a different principle of belongingness is stated for each group. This kind of response consists of two or more denotative principles accounting for all of the objects in the sorting. An example would be the

response, "These are rubber and these are paper." to encompass all five of the red objects in the relevant passive phase.

If a child repeats the verbal content of any of these primitive or confabulatory responses, the repeated responses are classified as a form of "perseveration." Perseverative responses are divided into four levels of complexity or maturity. When a child repeatedly tries to avoid the sorting and conceptualizing task with the same verbalization, the subsequent responses are placed at the least mature level of perseveration, Type I -- "avoidant" or "denial" techniques. If a child successively repeats the same non-denotative principle for subsequent tasks, the second (and any following similar) responses are scored as Type II -- "close perseveration." An example would be the child's repetition of the phrase, "I like them." for one of more successive sortings in the passive phase. Type III perseverative responses are those in which a denotative principle is expressed in the same verbal form for succeeding groupings for which the concept is inapplicable. An illustration would be the principle, "They are red," as correctly applied to one sorting in the passive phase and then inappropriately repeated for several succeeding sortings. Perseverative responses classified as Type IV consist of repeated inappropriate responses that differ in verbalized form,

but remain within the same "culturally-reinforced functional or generic class." For example, an appropriate principle based upon color is offered for one grouping; subsequent "color" concepts are offered inappropriately for groupings that do not "fit" the terms.

The first two types of perseveration are classified as "extreme" forms; Type III is termed "moderate," and Type IV as "perseveration tendency."

Refusals to sort or refusals to state a principle of belongingness are scored as "denials." "Justified denials" are responses including reasons why the objects do not belong together (e.g., "These can't go together because these here are round and these are square"). "Unjustified denials" are scored when the child gives no reason why objects have been grouped (e.g., the simple statement, "I don't know").

McGaughran (1963) has prepared a detailed manual for scoring "incomplete conceptual transactions." With a few exceptions, his guideline (see Appendix E) was followed in this study.

Whenever two ICT elements were scored in one response, only the most "mature" response was recorded. This general rule of recording the most "mature" element was followed whenever there were two competing elements within one ICT scoring category (e.g., "primitive conceptualization"). Similarly, if

a principle consisted of both primitive and confabulatory elements, the most mature element was scored (i.e., the confabulatory one). If both an extreme and a moderate confabulation were used, the more mature (i.e., moderate) confabulatory response was scored. If a multiple response contained both a pure ICT element and a pure CA element, this response was scored as an "ICT-CA blend." As discussed above, the sequence direction was also noted.

In summary, in the scoring procedures for ICT and CA systems of analysis, the initial step consisted of assigning all of the concepts into M, A, H, or I categories (blends being noted). The A, H, and I elements (also those appearing in CA blends) were examined for their applicability also within the rules of ICT scoring. The appropriate degree of primitive and confabulatory scores or denial was assigned for each relevant response. Further, the protocols were re-examined for perseverative qualities.

Scoring of culturally-reinforced concepts. The responses were analyzed by a third scoring system -- "culturally-reinforced functional or generic class" (CR) categories. According to this system, the concepts are assigned to one of the five following categories: (1) "function," -- "these are for working;" (2) "form," -- "these are square;" (3) "color," --

"red;" (4) "material", -- "these are paper;" and (5) "super-ordination," -- "tools." The CR scoring system was applied only to the open-public responses. In the case of blends, the CR quality of the most mature response was that which was recorded.

In preparing the OST records for scoring, all identifying marks (e.g., name, age, etc.) were removed. Each protocol was assigned a number from a table of random numbers. To insure anonymity, this procedure was carried out by some one other than the examiner. However, since the examiner both administered and scored the protocols, the records were not completely unfamiliar. To see if a bias in scoring had resulted, two judges were asked to assign the responses of ten protocols to the appropriate conceptual areas. Agreement with one judge was 95.3 per cent; or 181 out of 190 responses identically scored. Agreement with the other judge was 83 per cent. Average agreement between the two judges on the conceptual area scores was 89 per cent. There was one judge for the incomplete conceptual transactions scoring categories. For these, the percentage of agreement was 85.6. The ICT percentage was based upon the number of identical agreements (64 out of a possible 75) from ten records. It was not considered necessary to check the reliability of the "culturally-

reinforced" (CR) categories.

Specific Hypotheses

First hypothesis -- Social agreement. In the review of the literature, it was pointed out that a number of theorists and experimenters have characterized children as increasing steadily with age in responsivity to enculturation effects. From this the general hypothesis was derived that, as a child became older, he would evidence a more extensive sharing of common concepts in his culture.

McGaughran and Wylie (1962) have proposed a "public-private" dimension as a measure of the extent to which a child reflects social agreement in his conceptual behavior in an object-sorting situation. A second and refined scoring system (McGaughran, 1963) was devised to classify "incomplete conceptual transactions" in terms of their distance from the stating of a commonly-shared denotative principle. A third scoring system, "culturally-reinforced concepts", has been made available to categorize sortings into levels of complexity, ranging from simple "functional" concepts to more mature "superordinate" concepts. In order to test the general hypothesis of increasing enculturation in conceptualization, with increasing age, it was specifically hypothesized that, as age increased, there would be:

(1) a linear increase in the mean number of public concepts across the five age groups in the study;

(2) a general decrease with age in the mean number of incomplete conceptual transactions;

(3) an accelerated decrease of extreme (the simpler, less mature) incomplete conceptual transactions and a more gradual decrease of moderate and tendency (the more complex and mature) ICT scores; and

(4) an increase in material, form, and superordinate CR categories of the open-public responses.

Second hypothesis -- Order of conceptual classification. It was noted that several theorists described children's degree of abstraction as being relatively unrestricted in the younger and older years of childhood, but quite restricted in the middle years. On this basis, it was generally hypothesized that a curvilinear relationship between age and the order of conceptual classification would be demonstrated. That is, the younger and older children would be expected to employ an unrestricted, high order of conceptualization, and the medial-aged children would use a restricted, low order of conceptualization.

McGaughran (1954, 1956a, b) has provided a rationale and a measuring technique for assessing the orders of conceptual

classification in an object-sorting situation. The "open-closed" variable of CA analysis has constituted a measure of conceptual freedom. Sortings in the open-private area should reflect a comparative lack of restrictiveness in conceptual behavior. Sortings in the closed-public area (including "selective denials") should give some indication of restrictiveness in conceptualization. In order to test the hypothesis of a curvilinear relationship of order of conceptualization with age, it was specifically hypothesized that there would be:

(a) a curvilinear relationship between age and the mean number of open responses;

(b) a curvilinear relationship between age and the mean number of open-private responses;

(c) a curvilinear relationship with age and the closed-public responses; and,

(d) a curvilinear relationship with age and the mean number of selective denials.

From the previous research of Griffith (1957) and the descriptions of Werner (1957) and Piaget (1930), it was anticipated that maximum restrictiveness would appear in the eight-year-old group of this study. Thus, while some of the other measures might decline, it was expected that an unusually low number of open-private and open responses, and an unusually

high number of closed-public and selective denials, would be seen in this age group.

Third hypothesis -- Sex differences. A number of experimenters (e.g., Hunt, Harvey, and Schroder, 1961; Kagan and Moss, 1962; Caron and Wallach, 1959) have noted sex differences in conceptual performance. As an exploratory hypothesis, it was simply predicted that differences in the sortings would be found between the boys and girls of this sample.

As yet, no analysis of sex differences in CA analysis has been reported. In this research, it was specifically hypothesized that, when comparisons were made between males and females within age groups, a significant difference would be found. Because of the small number of subjects within each age group of this sample, this hypothesis was included only as an exploratory hypothesis.

CHAPTER FOUR

Results

Hypothesis One: Increases in Enculturation Effects

It was predicted that four measures would reflect increases in social agreement with age.

Public scores. While there were significant differences among the five age groups on this dimension (Table 1), the mean number of "public" scores did not follow the hypothesized smooth, positively-accelerated, linear progression (Table 2; Figure 1). The public scores of the eight-year-old children were significantly higher than either the six- or ten-year-old children (Table 3), and were identical in mean average with the twelve-year-old boys and girls. The eight-year-old group's scores deviated from the expected linear rise with age, and this precipitous increase achieved a significant departure from linearity (Table 1).

The unusually rapid rise in publicness among the eight-year-old children was followed by a decline in public scores achieved by the ten-year-old children. This peaked increase contrasted sharply with the smooth, upward progression of

Table 1

Analysis of Variance and Correlation Values for Age Group Scores on Conceptual Area Measures

Conceptual Area Measure	F ratio	p value	r	p value	eta	p value	linearity of regression	p value
Public	8.37	.001	.47	NS	.58	.001	4.05	.05
Open	2.84	.05	.11	NS	.39	.05	3.45	.05
Open-Public	12.82	.001	.63	.001	--	--	.32	NS
Closed-Public	4.06	.01	-.23	NS	.45	.01	10.91	.01
Closed-Private	2.73	.05	-.35	.01	--	--	.46	NS
Open-Private	4.71	.01	-.34	.01	.47	.01	3.16	.05

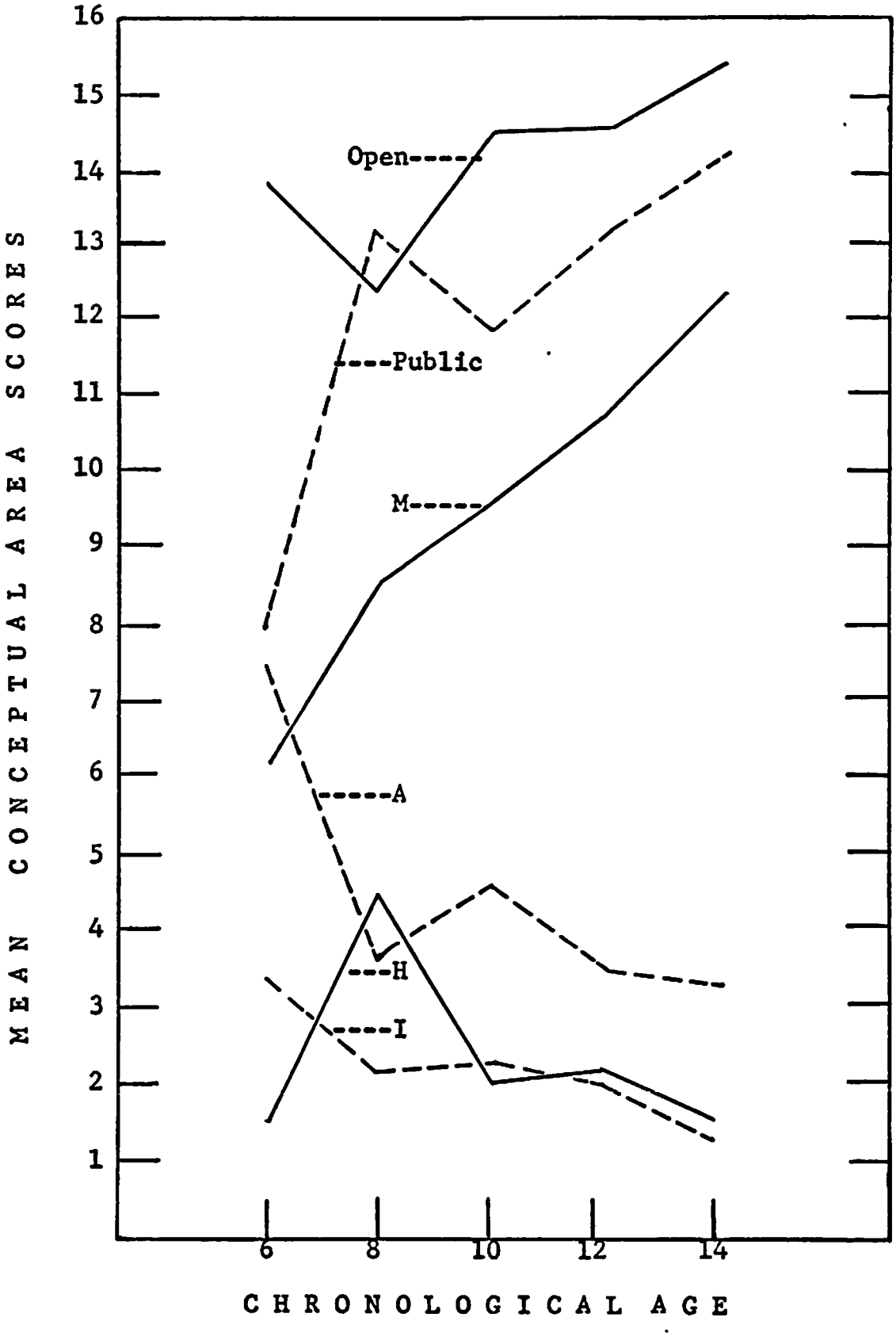

Fig. 1. Conceptual area scores across five age groups.

Table 2

Age Group Differences in Conceptual

Area Measures Scores

(N - 14 in each group)

Conceptual Area Measures	Group mean and standard deviation scores									
	Age 6		Age 8		Age 10		Age 12		Age 14	
	M	SD	M	SD	M	SD	M	SD	M	SD
Public	8.07	2.75	13.14	3.88	12.00	2.18	13.14	3.14	14.14	2.40
Open	13.93	2.66	12.43	3.19	14.57	2.63	14.64	2.73	15.43	1.57
Open-Public	6.36	2.15	8.72	2.35	9.86	1.69	10.93	2.89	12.36	2.51
Closed-Public	1.72	2.03	4.43	3.01	2.14	2.01	2.21	2.11	1.79	1.19
Closed-Private	3.36	2.05	2.14	1.34	2.29	1.18	2.14	1.61	1.50	.95
Open-Private	7.57	2.94	3.72	3.49	4.72	2.44	3.72	2.89	3.36	2.14

Table 3

Significance of Differences Between Age Group Means for Conceptual Area Scores

(N - 14 in each group)

Conceptual Area Measure	Age Comparisons							
	Age 6 vs. Age 8		Age 8 vs. Age 10		Age 10 vs. Age 12		Age 12 vs. Age 14	
	t	p	t	p	t	p	t	p
Public	8.05	.001	2.07	.05	2.11	.05	2.05	.05
Open	2.31	.05	3.63	.01	.13	--	1.65	--
Open-Public	5.13	.001	2.53	.02	2.33	.05	3.49	.01
Closed-Public	4.93	.001	5.73	.001	.16	--	1.52	--
Closed-Private	2.22	.05	.31	--	.50	--	1.07	--
Open-Private	5.58	.001	1.61	--	1.64	--	.69	--

public sortings in the three oldest groups.

Extreme, moderate, tendency, and Total ICT scores. As predicted, these scores declined with age (Table 4; Figure 2). None of the children used the least mature extreme primitive scores. Moderate primitiveness decreased more rapidly than the somewhat more mature primitive tendency scores.

Extreme confabulation decreased rapidly, with infrequent appearances after age six. Both moderate confabulation and confabulatory tendency scores, the more mature and complex measures, showed a more gradual decline.

The most simple kind of perseveration was not found among the children of this sample. The less mature perseveration Type II was infrequently used after age six. The more mature perseveration Types III and IV declined less rapidly.

With the exception of the infrequently-scored perseveration Type II, all (seven) separate measures showed significant over-all age differences in a declining direction (Tables 4 and 5). According to expectations, all of the least mature, simpler incomplete conceptual transactions declined more rapidly than the more mature, more complex measures (Tables 4 and 6; Figures 2, 3, and 4). This development supported the hypotheses that an increase in social agreement would be reflected in a decrease of incomplete

Table 4

Age Group Differences in Incomplete

Conceptual Transaction Scores

(N - 14 in each group)

Incomplete Conceptual Transaction	Group mean and standard deviation scores									
	M	SD	M	SD	M	SD	M	SD	M	SD
ICT Total	9.21	2.52	7.43	2.87	5.00	2.18	3.93	2.47	2.07	1.68
Moderate Primitiveness	1.43	2.28	.07	.26	.07	.26	.00	.00	.07	.26
Primitive Tendency	1.43	1.79	1.07	1.78	1.36	2.01	.79	1.16	.50	1.41
Extreme Confabulation	1.00	1.11	.14	.38	.21	.57	.07	.26	.00	.00
Moderate Confabulation	2.72	1.59	1.00	1.57	1.29	.99	1.00	1.04	.29	.72
Confabulatory Tendency	1.63	2.01	1.43	1.97	.79	.89	.29	.61	.21	.57
Perseveration Type II	.50	.85	.21	.57	.00	.00	.14	.53	.00	.00
Perseveration Type III	2.07	1.86	.50	1.16	.50	.85	.14	.53	.21	.57
Perseveration Type IV	1.79	1.47	.93	2.41	.72	.99	.14	.53	.14	.53
Denials (Sum)	1.00	1.64	3.72	5.16	1.29	1.68	1.79	2.05	1.00	1.11
Justified Denials	.57	1.23	2.64	2.41	1.07	1.55	1.07	1.15	.64	1.18

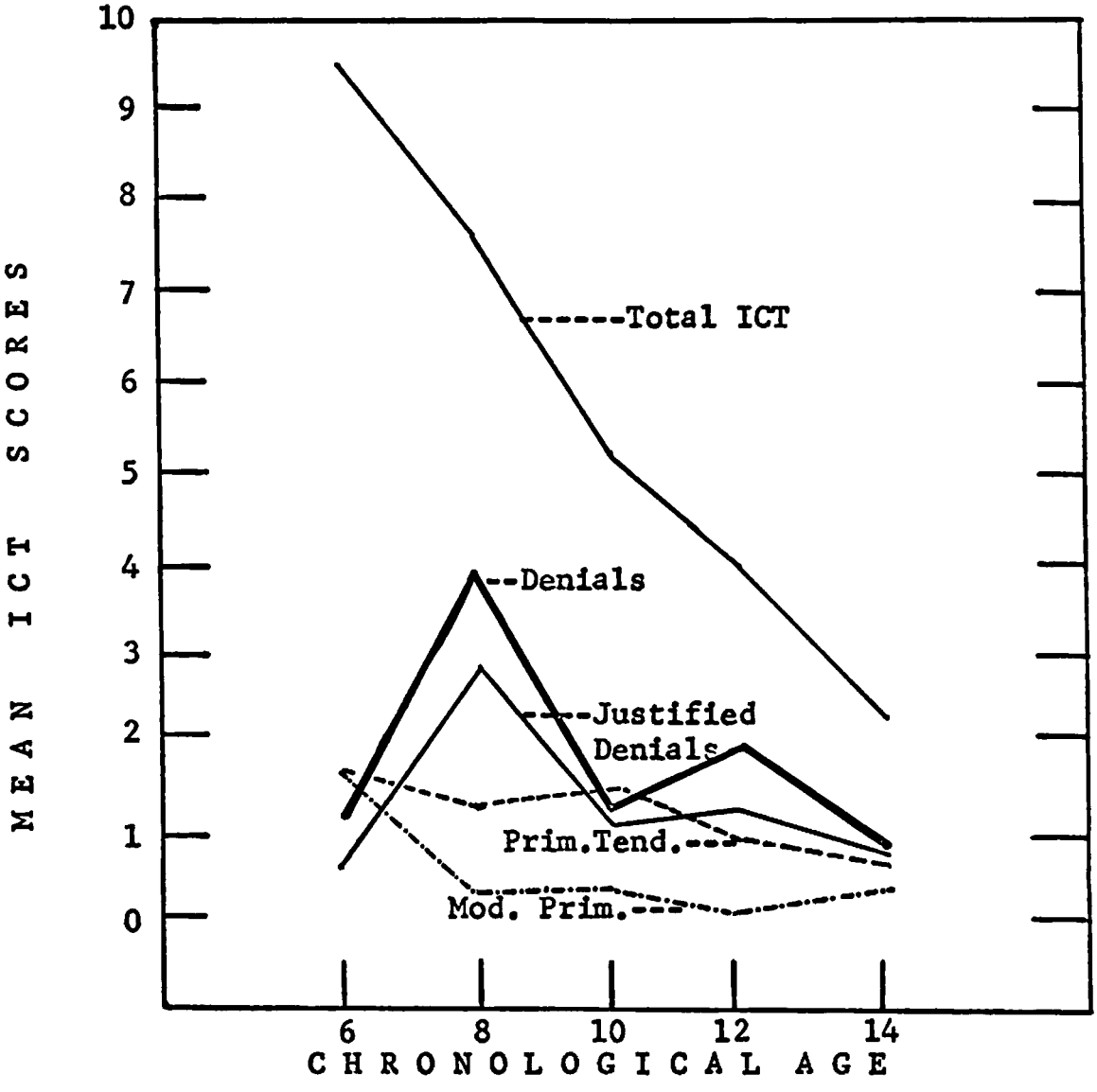

Fig. 2. Total ICT, Primitive, and Denial Scores Across Five Age Groups

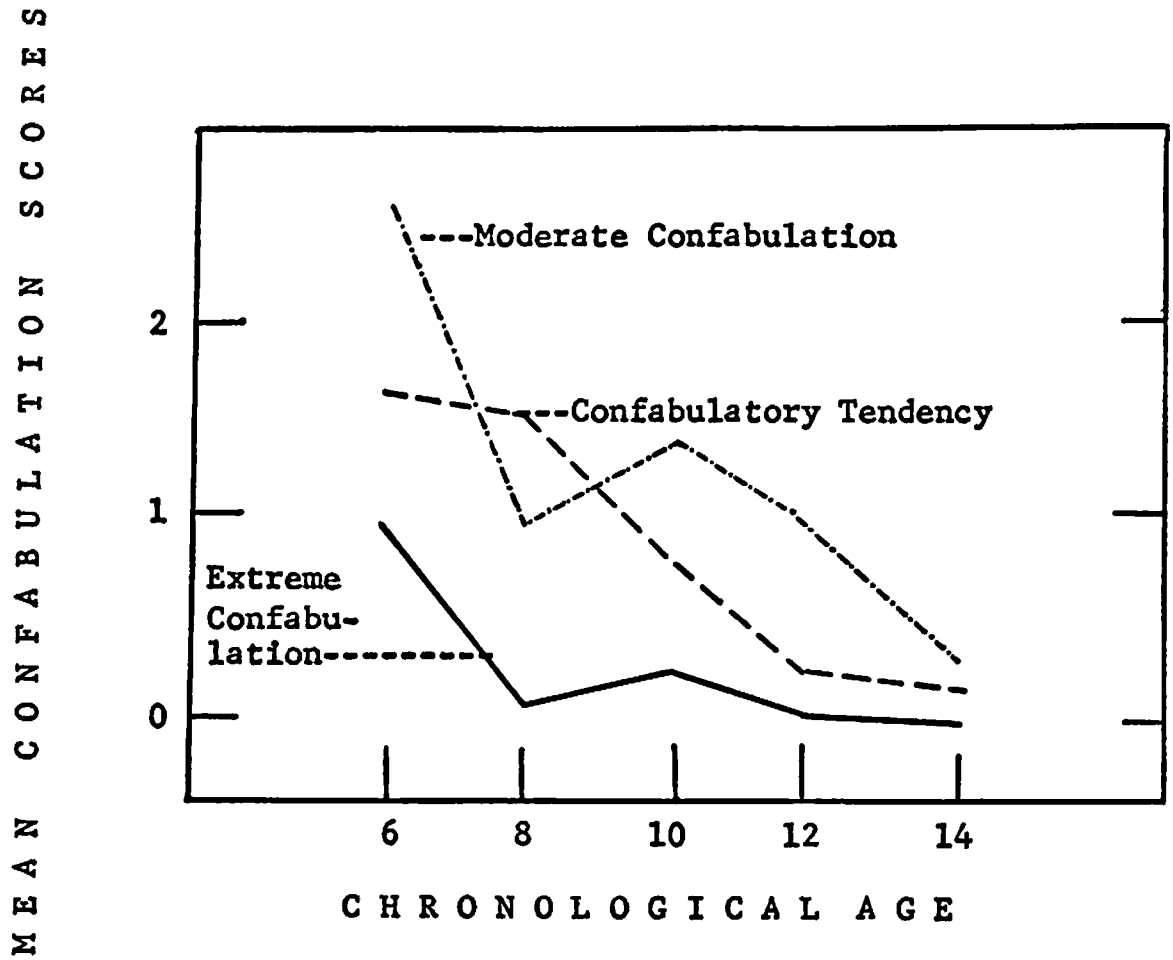

Fig. 3. Confabulation scores across five age groups.

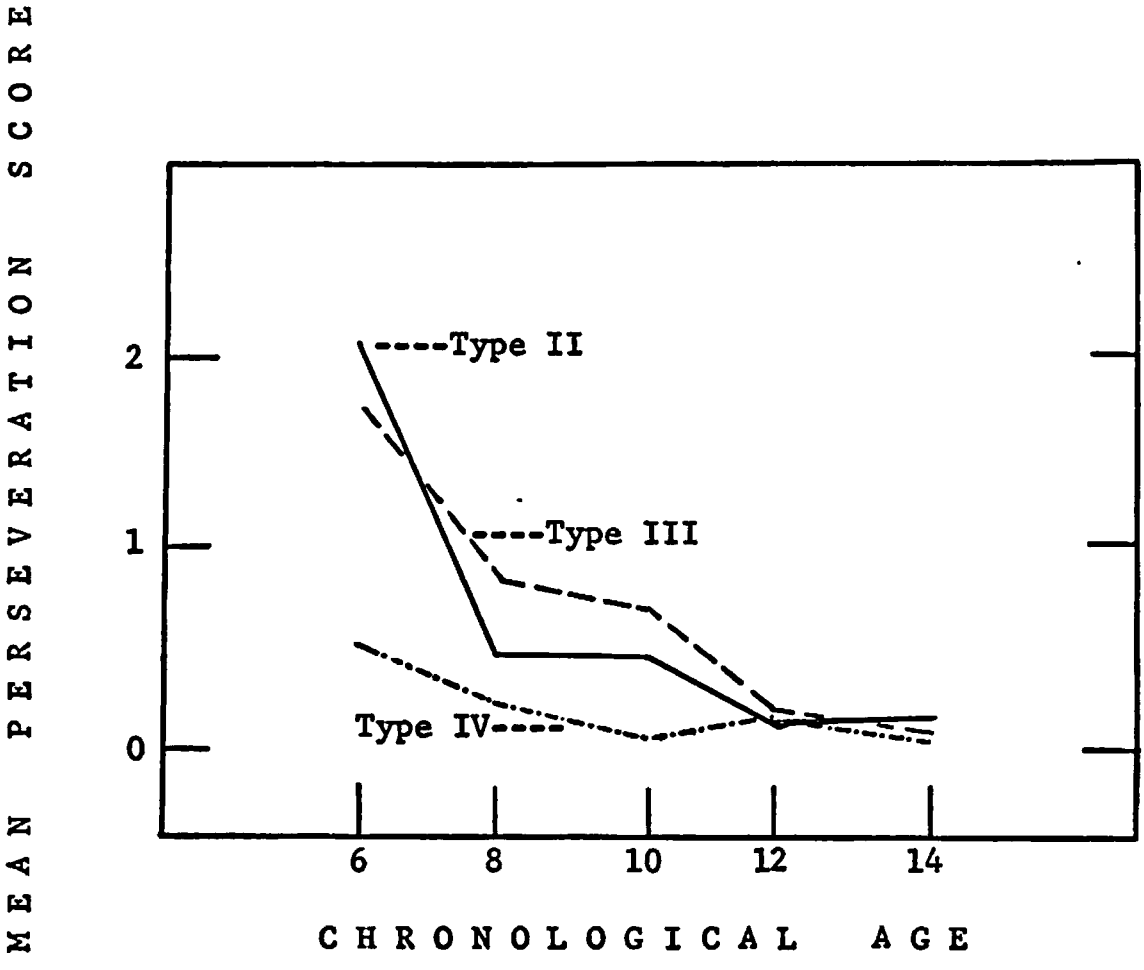

Fig. 4. Perseveration scores across five age groups.

Table 5

Analysis of Variance and Correlation Values for Age Group Scores on Incomplete Conceptual Transactions

Incomplete Conceptual Transaction	F ratio	p value	r	p value	eta	p value	linearity of regression	p value
ICT Total	22.08	.001	-.75	.001	--	--	.30	NS
Moderate Primitiveness	4.92	.01	-.35	.01	.48	.01	3.19	.05
Primitive Tendency	8.31	.001	-.28	.01	.72	.01	9.22	.001
Extreme Confabulation	8.03	.001	-.51	.001	--	--	2.33	NS
Moderate Confabulation	6.03	.001	-.31	.01	.52	.001	5.63	.001
Confabulatory Tendency	6.79	.001	-.33	.01	.57	.001	5.36	.001
Perseveration Type II	2.04	NS	--	--	--	--	--	--
Perseveration Type III	5.65	.001	-.42	.001	--	--	2.37	NS
Perseveration Type IV	5.59	.001	-.40	.001	.51	.001	2.89	.05
Denials (Sum)	5.41	.001	-.21	NS	.50	.001	5.83	.001
Justified Denials	3.93	.01	-.20	NS	.39	.01	2.87	.05

Table 6

Significance of Differences Between Age Group Means for Incomplete Conceptual Transactions

(N - 14 in each group)

Incomplete Conceptual Transaction	Age Comparisons							
	Age 6 vs. Age 8		Age 8 vs. Age 10		Age 10 vs. Age 12		Age 12 vs. Age 14	
	t	p	t	p	t	p	t	p
ICT Total	3.79	.001	4.19	.001	1.26	--	3.86	.001
Moderate Primitiveness	9.86	.001	.00	--	.50	--	.50	--
Primitive Tendency	1.00	--	.81	--	2.19	.05	.73	--
Extreme Confabulation	4.53	.001	.35	--	.54	--	.47	--
Moderate Confabulation	5.21	.001	1.07	--	1.16	--	2.37	.05
Confabulatory Tendency	.45	--	.57	--	2.88	.01	.53	--
Perseveration Type II	2.07	.05	1.91	--	1.00	--	1.00	--
Perseveration Type III	5.81	.001	.00	--	2.77	.02	.52	--
Perseveration Type IV	1.54	--	1.23	--	3.65	.01	.00	--
Selective Denials (Sum)	3.53	.01	3.24	.001	.00	--	3.36	.01
Justified Denials	5.05	.001	3.74	.001	1.79	--	1.30	--

conceptual transactions, and that the more mature scoring categories would show a more gradual decline with age.

As hypothesized, the total ICT score declined as age increased. The over-all difference among the five age groups was significant (Table 4). There was a substantial negative correlation between this measure and age. The scores declined in a smooth, negatively-decelerated, linear fashion (Table 5; Figure 2). Each age group differed significantly from the other age groups (Table 6). The decline of the total ICT scores gave clear support for the hypothesis of increasing social agreement with age.

Culturally-reinforced concepts. The upward progression with age of the form, material, and superordinate scores (Table 7; Figure 5) also confirmed the hypothesis of increasing social agreement. Scores for the superordinate category showed the highest relationship with age, followed by the material and form scores (Table 8). Unlike these three categories, the color scores did not differ significantly among the five age groups simultaneously considered (Table 8). The simple, less mature "function" scores showed a significant negative correlation with age. The differences between age groups on the function, material, form, and superordinates, quite frequently reached significance (Table 9).

Table 7

Age Group Differences in Culturally-Reinforced Concepts

(N - 14 in each group)

Culturally-Reinforced Concepts	Group mean and standard deviation scores									
	Age 6		Age 8		Age 10		Age 12		Age 14	
	M	SD	M	SD	M	SD	M	SD	M	SD
Superordinate	.14	.53	1.50	1.09	2.14	.89	2.86	1.19	3.50	1.41
Material	.93	1.16	1.43	1.50	2.71	1.10	2.07	1.03	3.14	1.25
Color	1.14	2.33	.79	1.11	1.07	.64	1.50	1.64	1.64	1.09
Form	.21	.57	1.21	1.25	.64	.72	1.29	1.10	1.50	1.45
Function	3.93	1.34	3.79	1.16	3.28	1.34	3.14	1.05	2.50	.92

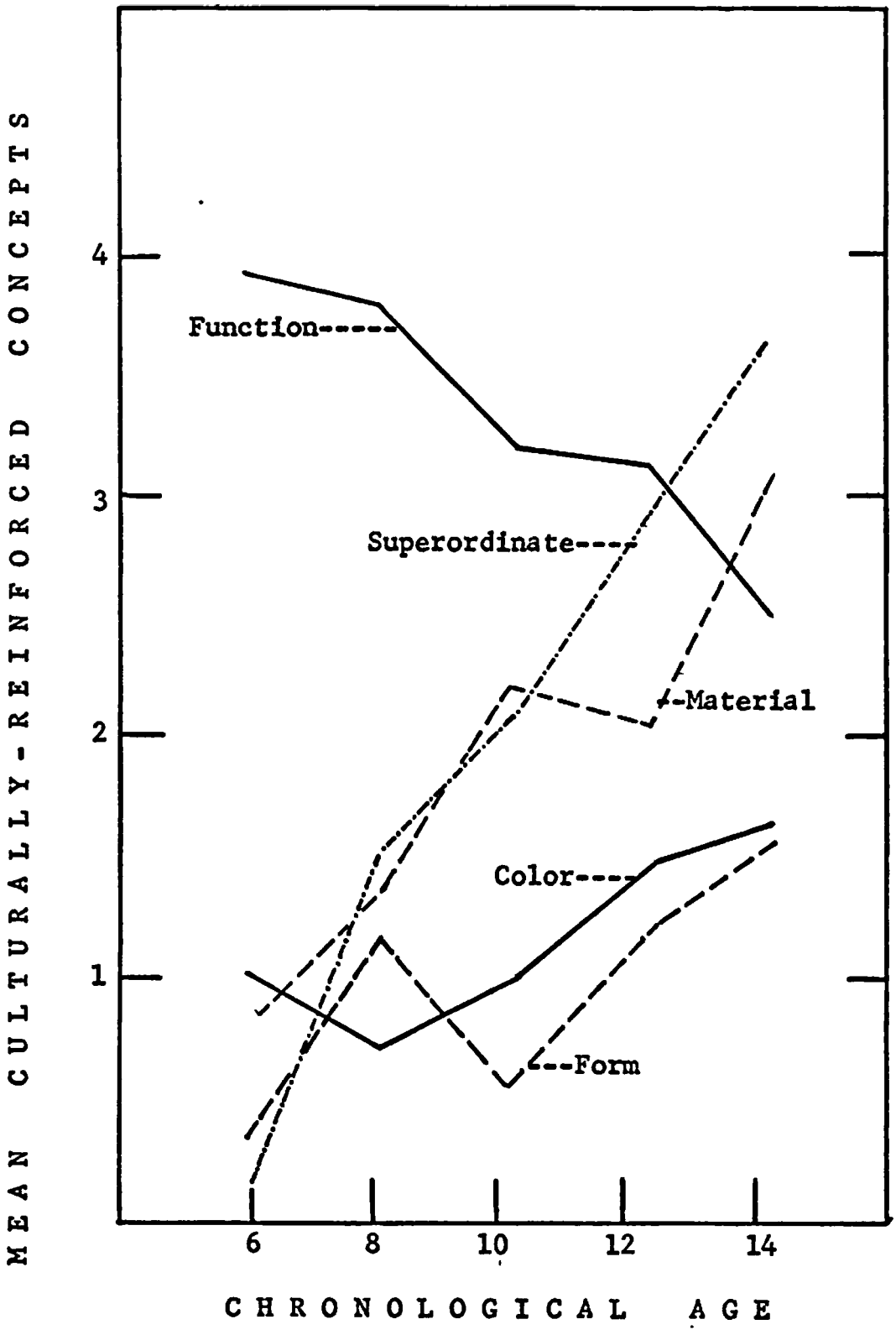

Fig. 5. Culturally-reinforced concepts across five age groups.

Table 8

Analysis of Variance and Correlation Values for Age Group Scores for Culturally-Reinforced Concepts

Culturally-Reinforced Concepts	F ratio	p value	r	p value	linearity of regression	p value
Superordinate	12.47	.001	.65	.001	.39	NS
Material	7.27	.001	.53	.001	.75	NS
Color	.79	NS	--	--	--	--
Form	2.38	.05	.28	.05	1.33	NS
Function	2.30	.05	-.29	.05	1.04	NS

Table 9

Significance of Differences Between Age Group Means

For Culturally-Reinforced Concept Scores

(N - 40 in each group)

Culturally-Reinforced Concept	Age 6 vs. Age 8		Age 8 vs. Age 10		Age 10 vs. Age 12		Age 12 vs. Age 14	
	t	p	t	p	t	p	t	p
Superordinate	4.86	.001	1.19	--	2.15	.05	1.86	--
Material	1.85	--	1.50	--	1.88	--	3.45	.001
Form	5.00	.001	3.06	.01	3.42	.001	.20	--
Function	.38	--	1.35	--	.44	--	3.05	.01

Note. -- The F ratio for the color category did not reach significance.

These significant increases in culturally-reinforced concepts reflected not only increasing socialization, but defined more closely the growing complexity of children's conceptualizations with age. This was clearly indicated in the more personally-oriented function responses (down from 62 per cent in the six-year-old group to 20 per cent of fourteen-year-old children's sortings). In contrast, the children showed a gradual increase with age in the use of the more objective generic terms. The more socially-reinforced superordinate sortings increased from an average low or 2 per cent among six-year-old children's concepts to a high of 29 per cent among the fourteen-year-old children's groupings.

In summary, almost all of the results concerning incomplete conceptual transaction scores (total ICT; extreme, moderate, tendency subcategories for primitive, confabulation and perseveration classes) and the culturally-reinforced concepts provide support for the general social agreement hypothesis. These results generally indicate a linear relationship between advancing age and increasing impact of enculturation effects.

However, results obtained with the CA public measure did not support the hypothesis of linear relationship with age increase. The unexpected rise of this score among the eight-

year-old children will be more fully considered in the discussion below.

Although not expressly hypothesized, a smooth linear relationship was found to exist between age advance and increase in open-public mean scores (Table 1). It seems likely that this measure fulfills the expectancy originally expressed for the total public scores (Cf. Table 2; Figure 1); this, too, will be discussed more fully below.

Hypothesis Two: Shifts in Levels of Abstraction

It was predicted that four measures would reflect a curvilinear relationship between the degree of abstraction and increasing age. All four provided clear support for this hypothesis.

Open responses. In comparing the average number of open responses across the five age groups, one finds that the means varied from (1) a high order of conceptualization in the youngest group; to (2) a relatively lower order of classification among the eight-year-old boys and girls; to (3) the relatively higher order of conceptual classification among the oldest children (Table 2, Figure 1).

There was a significant over-all difference across age groups on this measure (Table 1). The eight-year-old group's mean scores were significantly lower than the open scores

of each other group (Table 3). The negligible Pearson r contraindicated a linear relationship across the five age groups (Table 1). The scores departed significantly from a straight line. The best description of the relationship between scores on the open measure and age was a curvilinear correlation. The curvilinear relationship was predicted in the second hypothesis. Generally, the youngest children employed unrestricted concepts of a high order of conceptual classification. The eight-year-old boys and girls used more restricted concepts of a lower order of conceptualization. The older children of the sample used less restricted concepts; their responses reflected an increasingly higher order of conceptualization.

Open-private responses. These responses (A) were previously described as unrestricted sortings in which there is a kind of "free association" that does not account for most of the presented variance in the sorting. Hence, such responses are at a high level of abstraction. It was hypothesized that, while there would be a general decline with age in scores on this measure, this decline would be curvilinear; the eight-year-old group would employ more highly restricted concepts, and, accordingly, would show an unusually rapid decline in open scores.

Generally, these expectations of a curvilinear relationship

between openness-closedness of conceptualization and advancing age were met (Table 2; Figure 1). There were a number of sigficant differences between the separate groups (Table 3) as well as across all groups (Table 1). The eight-year-old group used a significantly lesser number of open and open-public concepts than the six- and ten-year-old groups; they also employed significantly fewer open-private concepts than the younger group.

Closed-public responses. High scores on the closed-public measure were interpreted as reflecting restrictiveness in sorting behavior. It was predicted that mean scores on this measure would be curvilinearly related with age, the eight-year-old group responding with the highest number of restricted concepts.

The findings implied this prediction. The H scores differed significantly in over-all group comparisons (Table 1), and there were significant differences between age groups six, eight, and ten (Table 3). Again, the best description of the relationship with age and H responses is curvilinear (Table 3). The eight-year-old group significantly used a higher number of H scores (Table 2; Figure 1).

Selective denials. This measure includes refusals to sort

(active phase) and rejections of the experimenter's sortings (passive phase). Consequently, it is regarded as a highly restricting approach to the task, a kind of moderately primitive H response. It was predicted that mean scores in this response category would show a curvilinear relationship with age.

This hypothesis was confirmed. The mean scores differed across all age groups (Table 5). As predicted, the eight-year-old group had the highest mean number of selective denials (Table 4; Figure 2). The relationship with age was more efficiently described as curvilinear (Table 5). Most between group comparisons also reached significance (Table 6).

In summary, the curvilinear relationship between age scores on each of the four measures of openness-closedness was successfully predicted. There were significant shifts with age in degrees of abstraction. Implied in this hypothesis was the anticipation that openness of conceptualization in the early years would be global and diffuse, and openness in the later years would be more integrated. One way to indicate the growth of complexity in children in their openness of conceptualization might be to contrast the occurrence of CA (more complex, more integrated) responses with ICT (less complex, less mature) at different age levels. Since both are usually forms of openness, it could be concluded that a decline in occurrence of

incomplete conceptual transactions coupled with an increase in conceptual area responses reflects growing integration. This was the finding (Table 10). The ratio of ICT scores to CA scores for open-private sortings dropped from 3 to 1 in the six-year-old boys and girls to 1 to 3 in the sortings of the oldest group.

Another example of developmental changes in conceptual integrativeness is the increase with age in frequency of superordinate concepts within the open-public category. The shift was from a mean low of two per cent in the six-year-old sortings to a high of 29 per cent in the oldest children's groupings.

Hypothesis Three: Sex Differences in Conceptual Area Analysis

The entries in Tables 11 and 12 are comparisons of male and female group scores for the conceptual area categories. When the over-all analysis of variance for males and females in all five age groups was computed, no significant difference was found.

However, when the groups are compared on the basis of age comparisons within each of the five age groups, a number of differences may be noted. Along the major CA scoring dimensions, there were significant sex differences in publicness of

Table 10

Age Changes in Percentage of CA and ICT Scoring Categories in Open-Private Concepts

Age	CA Scores (percentage)	ICT Scores (percentage)
Age 6	25	75
Age 8	26	74
Age 10	51	49
Age 12	65	35
Age 14	76	24

Table 11

Sex Group Differences in Conceptual

Area Measures Mean Scores

(N - 14 in each group)

Conceptual Area Measures	Group Mean Scores									
	Age 6		Age 8		Age 10		Age 12		Age 14	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Public	8.29	7.86	12.00	14.29	13.57	10.43	12.86	13.43	13.86	14.43
Open	13.86	14.00	12.71	12.14	14.86	14.29	15.57	13.71	16.29	15.14
Open-Public	6.86	5.86	7.71	9.71	11.29	8.43	11.43	10.43	12.00	12.71
Closed-Public	1.43	2.00	4.29	4.57	2.29	2.00	1.43	3.00	1.86	1.71
Closed-Private	3.71	3.00	2.00	2.29	1.86	2.71	2.00	2.29	.86	2.14
Open-Private	7.00	8.14	5.00	2.43	3.57	5.86	4.14	3.29	4.29	2.43

Table 12

Sex Differences Within Age Groups in Conceptual Area Measures Scores

(N - 14 in each group)

Conceptual Area Measures	Between Group Comparisons									
	Age 6		Age 8		Age 10		Age 12		Age 14	
	t	p	t	p	t	p	t	p	t	p
Public	.18	--	2.41	.05	4.68	.001	.64	--	1.08	--
Open	1.43	--	.79	--	3.00	.01	2.82	.01	3.11	.01
Open-Public	1.00	--	2.74	.02	4.61	.001	1.27	--	.92	--
Closed-Public	1.16	--	.39	--	.91	--	2.07	.05	.42	--
Closed-Private	1.20	--	.74	--	2.36	.05	.78	--	3.77	.001
Open-Private	1.10	--	4.51	.001	2.76	.02	.91	--	3.38	.01

conceptualization at ages eight and ten, and similar differences in openness of conceptualization within the three upper age groups.

CHAPTER FIVE

Discussion

The prediction of a linear relationship between "total public" scores in a conceptual task and advancing age in children was not supported in this study. However, it was demonstrated in the results of a number of other measures of conceptual performance, that age increase is linearly related to other aspects of increasing publicness in conceptualization; further it was successfully predicted that increase in order of of conceptual classification progresses curvilinearly with advancing age. Finally, sex differences were found in conceptual performance within separate age groups.

Hypothesis One: Social Agreement

Results obtained with the total public measure failed to support the hypothesis of a linear relationship between age and total amount of social agreement. In understanding this failure, one should take note of the varying results obtained with the two conceptual area measures underlying the total public dimension -- open-public and closed-public. The distribution of open-public scores followed a very distinct linear relationship with age; however, the rise of closed-

public scores from the age-six group to the eight-year-old group was so precipitous that it obscured this linear effect when the two component scores were summed to obtain total public scores.

Griffith's (1957) original finding was that the precipitous rise of total public scores for his seven-year-old group negated his hypothesis of a general linear increase with age for this measure. As discussed more fully below, Griffith suggested that this unexpected finding might be attributable to uncontrolled age differences in intelligence. However, these unexpected results were again obtained in the present study in which group differences in intelligence were controlled.

This replicated finding of age-specific changes in conceptualization at about the seventh-eighth year level merits further consideration. In some respects, this saltation in "public" conceptualization seems to correspond with a broader conception concerning the course of development in children. The Roman Catholic Church has taught for over a thousand years that children "come of age" around the seventh year. More recently, and more directly, Piaget has held that children ceased ego-centric communication around the seventh year. Hunt, in summarizing this view, writes as follows:

> It was commonly agreed that some kind of transformation was taking place in the social behavior of children at about the age of seven...With the development of the concrete operations, probably as a consequence of increasing autonomy of central processes, thought acquires a markedly increased degree of mobility that shows in the child's new ability to shift back and forth between part-part and part-whole relationships for classes and subclasses, and thought acquires a new independence of the child's own individual focus that shows in his seeing the conservation of quantity, numerical correspondence, etc. as a logical necessity. The increased mobility of thought permits the child to shift rapidly between the views of others and himself. The new independence of thought from perceptual to egocentric focus permits the child to sustain a topic. Together these capacities permit him to share a topic and also to share the obligation to keep the meanings of words used constant and the obligation not to contradict himself. Only thus can communicative interchange take place in which there is progressive unfolding of a topic, the chief thing missing is egocentric speech (Hunt, 1961, p. 217).

This emphasis upon "concrete operations," "increase in mobility," reliability and repeatability of shared meanings, etc., seems consonant with the observed conceptual behavioral characteristics of the corresponding age group in this study. The sudden and extensive increase in total public scores reflected, in large part, a correspondingly sudden omission of broad, privately-based groupings in favor of narrowerer, publicly-shared "reality-fixations." Such responsivity, it appears, is heavily reinforced in the early school years.

On the other hand, there may be an advantage in preserving the distinction between open-public conceptualization (in which,

in this study, there was a linear increase in the amount of social agreement), and closed-public conceptualization (in which in this study a saltatory change occurred between six- and eight-year-old groups). This distinction corresponds more closely with McGaughran's stress upon "...the necessity for an empirically-based multivariable system of analysis on the response or output side..." (McGaughran, 1962, p. 326). Central to this approach is the position that certain behaviors can be predicted more efficiently on the basis of conceptual area analysis (concepts located in a space common to two continua, as exemplified by the open-public and closed-public scores) rather than conceptual level analysis (concepts located on a point along a single continuum, as illustrated in the total public score). Perhaps, the most salient finding in this study is the clear support of the hypotheses by the conceptual area scores considered individually.

In this study, a general prediction was that total public scores would increase linearly with age. This prediction was based upon the assumption that, while closed-public responses would increase more rapidly, and at an earlier period, than open-public responses, the rates of change with advancing age would shift sufficiently within these classes to balance each other off, thus preserving the linear effect. The results

obtained that were not expected were the sudden rise and fall of closed-public grouping between the six- and ten-year groups, and a resurgence of open-private conceptualization in the ten-year-old group. These unexpected findings merit further study.

Other measures' results were interpreted as supporting the hypothesis of linear relationship between age and extent of social agreement. The general decrease in all scores for incomplete conceptual transactions suggest that as children grew older they completed the object-sorting tasks gradually in a more predictable fashion. It should be pointed out that the decline of the ICT scores is probably not due only to increasing socialization but also to the effects of increasing language facility, discriminative abilities, etc. Nevertheless, it seems clear that the behavioral changes described by Hunt, above, apply equally to the gradual shift away from the private quality underlying ICT responses.

This over-all interpretation of linear development is limned more clearly by the relatively rapid decrease of the extreme ICT scores as compared with the more gradual decrease of the moderate and/or tendency ICT categories. Finally, additional evidence of the gradual increase with age in amount of social agreement is seen in the linearly increasing occurrence of several of the culturally-reinforced concept categories

(material, form, and superordinates). In summary, most of the results with CA, ICT, and CR measures support the hypothesis of linear increase with age in extent of social agreement in conceptualization within the age range employed in this study.

Related research. The results of this research were consistent with the findings and predictions of the two previous studies of CA analysis of children's object-sorting behavior. Corresponding with Griffith's (1957) finding, there was a precipitous rise in the total public scores, contrary to hypothesis, in each study. The results were closely comparable, although Griffith used children of alternate ages; both studies revealed that the second youngest group had the unexpected sharp increase in total public scores that significantly departed from linearity.

Griffith suggested that this rise was associated with the significantly higher rating of intelligence in his second youngest group. His seven-year-old group had an average intelligence of 118 on the Columbia Test of Mental Maturities (CTTM). To support the inference that excessive publicness was associated with higher intelligence, he reported a significant correlation between public scores and intelligence estimates. His general conclusion was: "It seems that intelligence facilitates the use of public responses to the groupings"

(Griffith, 1957, p. 28).

There is evidence in the present study that rating of verbal intelligence is not a prevailing factor in determining this age-specific deviation toward higher public scores. Not only was intelligence controlled across the five age groups (which was not the case in Griffith's work), but the correlations between intelligence estimates and total public scores did not reach significance. Unlike the findings in Griffith's study, the Pearson product-moment r was -.07 between intelligence and publicness (As in Griffith's research, the correlation between intelligence and openness did not reach significance).

An economic, but not very compelling conclusion with presently-available data, would be that the sudden rise in total public scores occurs in the sorting behavior of seven-year-old children defined as "bright-normal" by the CTTM and in eight-year-old children defined as "average" in intelligence by the WISC vocabulary subtest. In the latter study, the acceleration of social agreement was not explicable on the basis of intelligence differences between groups. This, too, warrants further study.

The results of this study offer favorable evidence for the predictions of Wylie (1957) and McGaughran and Wylie (1962) who, from their findings in the conceptual area analysis of

three- , four- , and five-year-old children, hypothesized that the gradual continuity of conceptual development in their age groups would continue to appear in a sample of older children. Clearly evident throughout their data analysis was a gradual, continuous increase or decrease with age along the various CA, ICT, and CR measures. The one departure from these findings in the present study was the sudden "peaking" of closed-public (and, thus, total public) scores, as discussed above.

Broadly considered, the findings of this study were also consistent with the observations of Cameron (1938), Piaget (1926), and Werner (1957) concerning the general effects of enculturation upon the conceptualization of children of the early school years.

Hypothesis Two: Order of Conceptual Classification

The fluctuations with age in scores on the total open measure clearly confirmed the hypothesis of a curvilinear relationship between age increment and change in restrictiveness of children's conceptualization. Age group differences in total open scores followed this predicted pattern: (a) a relatively high degree of openness, or "freedom" of conceptualization in the youngest children's sortings; (b) relatively less freedom in the groupings of children in middle age groups;

and (c) the highest degree of freedom by the older children in the sample.

The research results obtained demonstrate that the eight-year-old children display a relatively lower potential for including a multiplicity of objects within their conceptual realms than any of the other age groups. The "narrowing" of conceptual limits in the sorting behavior of the eight-year-old children can be characterized as a reliably-observed tendency in this age group to "fix reality" through the use of relatively highly differentiated categories.

Additional support for the hypothesis was supplied by the predicted results obtained with two of the CA and one of the ICT measures. Although scores on the open-private measure declined with age, it decreased in a curvilinear fashion, dipping well below the straight line effect in the eight-year-old children's sortings. A responses frequently seem to be free-association-type conceptual responses, triggered by the first discernible cue. Generally, little effort appears to be exerted to account for all or even most of the presented variance in a sorting group. This type of response frequently seems to lack requisite "reality-checking." While this approach to sortings was expected to decline with age, it was predicted that the decrement would be curvilinear. It was anticipated

that the eight-year-old children would stress reality-fixing and inhibit the more personal associations.

The curvilinear decline of the A responses in the eight-year-old group becomes more meaningful when those responses are analyzed into incomplete conceptual transactions and complete CA response components (Table 10). Two of the ICT categories (primitive and confabulation) served to codify responses as open-private in nature but, by definition, do not include complete CA responses. These "incomplete" forms of conceptualization are predominant in the sorting behavior of the six- and eight-year-old children, but diminish rapidly in the sortings of the three older age groups.

With over-all age increase, there is a corresponding gradual decline of A responses. In the middle age groups, the ICT type of open-private conceptualization declines rapidly, while the complete CA response frequency is still increasing. The eight-year-old children use relatively fewer open-private responses, but the ICT component still predominates. The ten-year-old children use more open-private sortings, but these responses consist of a more mature form of complete conceptual area concepts. Consequently, the sudden decline of A concepts (both incomplete and complete) in the eight-year-old children does not necessarily lead to the conclusion

of a more mature form of responsivity than that shown by the ten-year-old children who actually use more A concepts. The eight-year-old children retain, rather, a lessening (but existent) degree of ICT responses while, at the same time, they follow their age-specific predilection to introduce response preference for closed-public concepts.

The closed-public response was so frequently used by the eight-year-old children, that its relationship with age is curvilinear. This response involves a more complete analysis of existent attributes in the sorting situation, but it also involves an inability to inhibit incorporating these multiple features within the "collecting principle. Because of this, H sortings are characterized as "stimulus bound." Like the A responses, the H category consists of two components -- selective denial responses and the relatively more mature, complete CA response to multi-analysed features. While the distribution across age groups of these separate component measures did not reveal a consistent pattern, the over-all H score distribution furnished a clear measure of restrictiveness in the eight-year-old group. A and H scores across age groups followed the pattern of (a) many incomplete, private concepts by the six-year-old subjects; (b) a relatively highly differentiated, restricted approach by the eight-year-

old children; and (c) many complete, private concepts used by the ten-year-old group.

This interaction of A, H, and M responsivity is in keeping with the implication in the second hypothesis that with age increments there would be non-linear changes in openness, ranging from diffuseness to differentiation to integration of responses across the ages. It should be noted that, as with the total public measure, scoring total open obscures some important trends that require further analysis of the measure into its CA components. While, on the surface, comparison of mean scores on the total open measure would seem to indicate that the openness of the six-year-old children is comparable to the openness of the older groups, only a breakdown of these global measures into conceptual area components reveal the growing response-complexity. Accordingly, the open measure would be acceptable as a rough indicator of differences in restrictiveness, but the scores must also be considered in terms of the CA components for a more accurate description of children's increasing conceptual maturity.

All of the measures gave support to the idea of increasing integration and complexity of responses. The frequency of A responses generally declined from 56 per cent to 22 per cent across all age groups. Correspondingly, the M responses

increased from 46 per cent to 78 per cent of the sortings. Whereas ICT responses collectively accounted for nearly half of the six-year-old children's sortings, this diffuse form of conceptual response had declined to 11 per cent in the oldest group's sortings. The "function" (CR) response (considered as a less mature form of M response, reflecting verbal inefficiency) declined from its prevalence in 77 per cent of all six-year-old CR responses to a low of 23 per cent. Frequency of superordinate, material, and form responses rose rapidly with age from a low of 23 per cent to a high of 77 per cent.

Related research. The finding of a curvilinear relationship between chronological age increments and order of conceptual classification coincides with the results of Griffith's (1957) investigation. Despite his use of different, alternating age groups, his results appear to correspond quite closely with those obtained in this study. The present findings also correspond with more general observations that younger children achieve a higher order of abstraction in their conceptualization but are deficient in communication, while intermedially-aged children employ a lower order of abstraction but show an increase in this social skill, and the older children are both relatively high in order of abstraction and able to communicate in a relatively more efficient,

socially-predictable fashion. These are the general observations of Werner (1957) and Piaget (1930).

Additionally, there are a number of other indications of relationships between the present findings and those reported in the experimental literature. Silverstein (1959) predicted correctly that younger children use many "functional" responses. Nunnally and Flaugher (1963) reported that their nursery school children "...responded almost entirely in terms of 'functions' -- i.e., with what things do or what can be done with them..."

Ames, Learned, Metraux, and Walker (1959) found that eight-year-old children used the highest number of card rejections and denials in a Rorschach situation, reporting "This is an all time high in denials." The responses of the eight-year-old subjects of this study constituted an "all time high," also, in number of selective denials.

Third Hypothesis: Sex Differences

The hypothesis that there would be sex differences in amount of social agreement and order of conceptualization received tentative support in this study, although the direction of these differences was not always consistent.

Significant differences were not found when both males

and females were compared simultaneously (analysis of variance) across all five age groups. However, when boys were compared with girls on the same grade level, it was found that the boys employed a higher order of conceptualization; these differences reached significance at ages ten, twelve, and fourteen. Thus, boys were found to be consistently less restrictive in conceptualization in these upper age groups. On the social agreement dimension, the sex group attaining the highest scores changed from intra-age comparison to intra-age comparison. That is, the eight-year-old girls had higher public scores. In the tenth year, this finding was reversed, but the fourteen-year-old girls again scored significantly higher in number of public concepts.

Related research. This prediction was originally hypothesized because Caron and Wallach (1959) found similar sex differences in cognitive behavior. They used a concept-attainment task to measure preferences for "breadth of categorization." Their results indicated that fifth-grade girls took minimal "risks" in terms of category-width preferences, while boys were less "conservative" in categorizing events as similar. Although the tasks used in their research differ considerably from those in this present study, it was felt that sex differences might also be found in object-sorting

responses, particularly in terms of the open-closed measure; that is, it was anticipated that "breadth of categorization" might be one of the components of the more generic conceptual characteristic -- order of conceptualization.

Most developmental theorists have apparently assumed that sex differences in conceptual development either do not exist or are lacking in theoretical relevance. Consequently, although some of the results of the study are consonant with previously obtained empirical findings, no generalizations will be attempted until these findings have been replicated under more specific experimental conditions.

Future Research

Several results obtained in this study point to the need for further research; this further empirical inquiry should serve to replicate or to extend current findings of developmental trends in conceptual behavior. In either case, the yield should be an established base for the extension of theory in this area.

Because the results of this investigation and that of Griffith's differed in findings concerning the effects of intelligence, further investigation of the effects of intelligence when different types of intelligence measures are used

might be rewarding.

It seems likely that development changes in publicness of conceptualization might be more closely analyzed, with a particular effort to isolate the different kinds of behavioral referents for open-public and total public scores. This new study would appropriately concentrate on differences among seven- through eleven-year-old groups.

Sex differences across the age groups should be analyzed in more detail and with a larger sample. Also, further research might provide additional information of sex differences in subjects, if sex of examiner were systematically varied.

CHAPTER SIX

Summary

The Rapaport modification of the Goldstein-Gelb-Weigl-Scheerer object-sorting task and the vocabulary sub-test of the Wechsler Intelligence Scale for Children were administered to seventy elementary school children. Seven boys and seven girls were included in each of five age-grade groups: (a) six-year-old first-graders; (b) eight-year-old third-graders; (c) ten-year-old fifth-graders; (d) twelve-year-old seventh-graders; and (e) fourteen-year-old ninth-graders. There were no differences in mean intelligence scores among the five age groups, among the same sex categories across the five age groups, or between the sexes within each age group. Between sex comparisons within each of the five groups did not result in significant intelligence differences.

McGaughran's (1954, 1963) conceptual area analysis, incomplete conceptual transactions, and culturally-reinforced concepts scoring systems were applied to the object-sorting behaviors of these subjects to test three hypotheses.

The measures which furnished some support for the hypo-

thesis of a specific relationship between chronological age and the amount of social agreement were (a) the rapid decline of extreme ICT scores and the gradual decline of moderate and tendency ICT measures; (b) the linear decline of the total ICT measure; (c) the rise of the superordinate, material, and form CR categories. Distribution of total public scores, obtained by combining two conceptual area measures, did not follow the prediction of gradual linear rise with age. Rather, it showed that there was a precipitous rise in the sortings of the eight-year-old children, raising some question whether this measure provides the most efficient description of extent of social agreement. Thus, three of the four hypothesized measures supported the prediction of specific effects of enculturation upon the conceptual behavior of children; and one measure did not. Apparently, the open-public measure provides the clearest indication of gradual linear increase with age as a function of enculturative effects.

The second hypothesis -- that there would be a curvilinear relationship between age level and level of abstraction -- was confirmed. The specific measures in this analysis were: (a) open scores, a combination of two CA scores; (b) open-private scores; (c) closed-public responses; and (d) selective denials. The results indicated that the eight-

year-old children were significantly more restricted in their conceptualizations than either the younger or older subjects. The prediction that the open responses of the older children would be more complex than the open responses of the younger children was also supported.

Both sets of findings were consistent with the observations of a number of investigators of children's conceptual behavior. The first hypothesis coincided with the common observation that the conceptual behavior of the growing child reflects the increasing impact of his social training. The second hypothesis is consistent with the observations of others -- children are diffuse and global, conceptually, in the early years; employ many specific differentiations in the intermediate years; and use less restricted, hierarchically-integrated concepts later in development.

Support was found for the third prediction that there are unspecified sex differences in conceptual behavior as measured on the amount of social agreement and order of conceptualization continua. Although significant sex differences were found in this study, no generalizations were attempted, pending the replication of these findings with a larger sample.

Generally, the conclusions of the study were that conceptual area measures are sufficiently sensitive to reveal

changes with age in the two dimensions of conceptual behavior. The broader "total" scores (i.e., open and public) however, are probably less useful than the specific CA, ICT, and CR categories in describing these age changes.

A program for further research was outlined briefly, with particular attention given to the role of intelligence in the prediction of age changes in conceptual behavior, a more detailed analysis of conceptual changes in the intermediate years, and the establishment of additional behavioral referents to provide a broader empirical basis for theorizing about conceptual development in children.

APPENDICES

Appendix A

t Test Comparisons of Mean Intelligence and Age for Five Age-Grade Groups

Variable	Age 6 vs. Age 8 t	Age 8 vs. Age 10 t	Age 10 vs. Age 12 t	Age 12 vs. Age 14 t
Intelligence				
Total group, inter-grade (26 df)	.63	1.31	1.75	.60
Same Sex: inter-grade, Female (12 df)	.53	.53	1.33	.00
Same Sex: inter-grade, Males (12 df)	.32	1.13	1.15	1.03

	Age 6 t	Age 8 t	Age 10 t	Age 12 t	Age 14 t
Between sexes; intra-grade	.18	.18	.24	.27	1.03
Age					
Between sexes; intra-grade	.10	.22	.00	.00	.22

Note: No group difference was significantly (<.05) greater than chance.

Appendix B

Description of Object Sorting Test Objects

1. One white, lined, 3" by 5", paper file card
2. One red, paper circle (4" in diameter)
3. One green, paper square (white on reverse side; 4" by 4")
4. One red, paper matchbook (including matches)
5. One white, "king-sized" cigarette (filtered; mint green letters s-a-l-e-m)
6. One white, red-tipped, candy cigarette (4" long)
7. One brown, cellophane-wrapped, red-banded cigar (5½" long)
8. One rubber, reddish-brown, red-banded imitation cigar (5")
9. One black-stemmed, straight-stemmed, brown-bowled pipe (5")
10. One red, rectangular, rubber eraser (2½"; lettered r-u-b-y)
11. One red, round, rubber ball (1½" in diameter; with animals in bas relief)
12. One red, round, cylindrical-shaped sponge (diameter 2"; 1½" thick)
13. One white, round, rubber bath-stopper with small, steel ring (2" in diameter)
14. Two beige, tapering bottle corks (1" high; 3/4" diameter at top end, ½" at bottom end)
15. One silver, metal and plastic-handled, toy hacksaw (lettered m-a-r-x; 5" long)
16. One green-handled, steel toy screwdriver (5½" long)
17. One red, wooden-handled toy hatchet with wide blade (4½")
18. One purple, wooden-handled, steel-headed toy hammer (4½")
19. One silver, steel, toy, adjustable, open-ended wrench (4" long; lettered m-a-r-x)
20. One silver, steel, toy pliers (4½" long)
21. One silver, steel, real pair of pliers (6½"long)
22. One maroon, wooden-handled, real screw-driver (7" long)
23. One aluminum, "steel-colored", toy table knife (4½" long)
24. One aluminum, "steel-colored," toy table fork (4" long)
25. One aluminum, "steel-colored," toy table spoon (3½" long)
26. One stainless steel, real table knife (8½" long)
27. One stainless steel, real table fork (7¼" long)
28. One stainless steel, real table spoon (6" long)
29. One bronze, circular, convexed-sided, key lock (2½" long; 1½" wide)
30. One black, wooden cube with nail (cube: 1"; nail: 2½" long)
31. Two white cubes of sugar (½" by ½")
32. One chrome-plated, round bicycle bell (lever action; with two adjustable screws; 2½" in diameter)
33. Two steel nails (2½" long)

Appendix C

Scoring Categories for Incomplete Conceptual Transactions

Category and description of category content	Examples
I. Primitive Conceptualization	
Verbalization of "concept" (if offered) lacks denotative (attributive) characteristics correctly distinguishing the principle for objects grouped from that of any group of stimuli.	---
A. Extreme Primitiveness (preconceptual)[a]	
1. Lack of principle[a]	
S plays with objects without verbalizing a principle, without naming, characterizing, or identifying them, and without expressing denial or avoidance; he may chatter.	1. "I want this and this goes next and this and this," etc. 2. "Like this and like that, and this goes there, and..." etc.
2. Indirect or incomplete denial or avoidance[a]	
(a) S may or may not group objects but indirectly denies, or avoids stating, a principle. If S does not group and verbalizes his denial directly, score as selective denial.	S shrugs shoulders, shakes head, reflects E's questions, or otherwise responds to E, but fails to comply.

(Appendix C continued on next page)

Category and description of category content	Examples
(b) In active phase, S groups two or more objects but either verbally denies their relatedness, or voids E's questioning.	"I don"t know," "Because," "No," "I'm done," "They just do," "They have to," "Go together," "That's all," etc.
(c) In passive phase, S adds objects to group but states that he does not know why they belong.	---
(d) S does not group any objects in active phase, or adds no objects to group in passive phase, and denies knowledge of a principle for three consecutive trials; these responses and all succeeding denials are scored as falling within this class (cf. selective denials, below).	---
B. Moderate Primitiveness (paraconceptual)[a]	
1. Indeterminate principle (nondenotative)[a]	
(a) In active phase, S groups an infrequent or unfamiliar pattern and verbalizes (without further explanation) a nondenotative, generalized principle of similarity or identity to apply to groups as a whole (i.e., one that is	"All alike," "Look alike," "Sound alike," "All the same," "Same kind," etc.

(Appendix C continued on next page)

Appendix C (Continued)

Category and description of category content	Examples
in no way specific to the attributes of the grouped objects--cf., C.1.a., below.	
(b) In active or passive phases, S verbalizes (without further explanation) a nondenotative, generalized principle of similarity or identity (as in B.1.a., above) to conceptualize familiar total groupings other than those based on common color, form, or species-identity.	"All alike," "Look alike," etc., for smoking equipment, tools, etc.
(c) In passive phase, if 3 or more "identity" conceptualizations (as in B.1.b., above) are offered for total groupings based on common color, substance, etc., these and all other such conceptualizations on the passive phase are scored within this category (cf. C.1.b., below).	"All alike," "Look alike," etc., for red objects, metal objects, etc., for three or more groupings.
(d) In either active or passive phases, S employs non-denotative principles other than those based on similarity or identity (e.g., as in personal mediation, "animism," "omnipotence," neologisms, etc.) to apply to the total grouping.	1. "Because I play with them" (metal objects). 2. "Because they want to be together." 3. "Because I want them together."
2. Object Naming[a]	
S names or identifies one or more objects in either phase but offers no principle	"That's a cigarette, and that's a card," etc.

(Appendix C continued on next page)

Category and description of category content	Examples
for the grouping. Simply verbalizing the species-words (e.g., "Whose eraser is that?") does not qualify as identifying the object.	
C. Primitive Tendency (quasiconceptual)[a]	
1. Implicit denotation	
(a) In active phase, S groups a frequent or or familiar pattern but verbalizes (without further explanation) only a generalized, "identity" concept (cf., B.1.a., above).	"All alike," "Look alike," etc., for white objects, metal objects, etc.
(b) In passive phase, S offers less than three "identity" concepts (without further explanation) for groupings based on common color, substance, etc. (cf. B.1.c., above).	"All alike," "Look alike," etc., for white objects, pairs of objects, etc., for less than three groupings.
2. Incorrect denotation	
S assigns a single, incorrect, but denotative (frequently hyperabstract) principle to an entire grouping in either phase. However, if principle is applicable to part of the grouping, score as either extreme or moderate confabulation.	"All blue," "All gold," "All fat," "All short," "All hard," "All soft," etc.

(Appendix C continued on next page)

Category and description of category content	Examples
II. Selective Denials[a]	
S denies his ability to conceptualize specific groupings; his response indicates that he differentiates one group of objects from another in terms of his ability to impose conceptual order. If three or more denials occur consecutively, these and all others are scored as serialized denials (cf, I. 2.d., above).	---
A. Active Phase	
S adds no objects to a specific stimulus object and says he knows no basis for any conceptual grouping.	(stimulus object--toy pliers) "That's a puller." Q? "No, I don't know."
B. Passive Phase	
S says that he does not know the basis for a specific grouping arranged by E, or he conceptualizes a part of the grouping and pointedly denies that this concept applies to the omitted objects.	(toy tools and real tools) "Only these (toys)--play with these."
III. Confabulatory Concepts	
S attempts to conceptualize a grouping on the basis of perceived characteristics or relationships among only a part of the objects within a grouping; the partial conceptuali-	---

(Appendix C continued on next page)

Category and description of category content	Examples
zation may or may not be accurately applied to its referents.	
A. Extreme Confabulation[a]	
The concept concerns the functional or structural characteristics (not only names) of one or two separate objects, or a relationship (including species identity) between a pair of objects; S says nothing about the inapplicability of the concept for other objects in the group.	1. (rubber objects) "Erase with this and play ball." 2. (smoking equipment) "Light pipe with matches."
B. Moderate Confabulation[a]	
The concept concerns the functional or structural characteristics (not only names) of three or more of the separate objects, or two or more subsets of objects, or a relationship (including specie identity) among three of or more (but not all) objects in a group; S says nothing about the inapplicability of the concept for other objects in the group.	1. (tools) "Hammer nails in, saw wood, put in screws..." etc. 2. (all toys--including toy tools) "These are for work."
C. Confabulatory Tendency[a]	
S gives several concepts for objects, or subsets of objects, within the grouping and in so doing accounts for all of the objects without, however, indicating a principle of belongingness applicable to the entire group as a unit.	(all paired objects) "Eat with these, smoke, work, and two corks for bottles."

(Appendix C continued on next page)

Category and description of category content	Examples
IV. Perseveration	
S repeats a concept, with varying degrees of departure from the original verbalization, for subsequent object-groupings for which the conceptualization is indeterminant or incorrect. Perseveration is not scored for repetitions of correct, determinative concepts in subsequent groups. Also, perseveration is not scored if a "higher" subcategory (i.e., any subcategory occurring lower on this table than the original subcategory) content applies to the later response.	---
A. Perseveration of Denial[a] and Avoidance Tactics	
S repeats the key words (or gestures) of an immediately preceding response to deny indirectly or to avoid stating a principle of conceptualization (Cf. I.A.2., above--Direct selective denials are not scored in this category unless they occur in 3 consecutive responses). He may add to or subtract from the original statement.	---
B. "Close" Perseveration[a]	
S repeats the key words of an immediately preceding response setting forth an indeter-	---

(Appendix C continued on next page)

Category and description of category content	Examples
minant principle of conceptualization (Cf. I.B.1., above). He may add to or subtract from the original statement.	
C. Mediate Perseveration[a] S repeats the key words of a preceding denotative response without adding to, subtracting from or rearranging the elements of the original conceptualization.	1. (round objects) "These are round."--(paper objects) "Round."
D. Distant Perseveration[a] S repeats the key words of a preceding denotative response, but also adds to, subtracts from, or rearranges the elements of the original conceptualization.	1. (round objects) "These are round."--(paper objects) "Round, and square, and a cigarette." 2. (round objects) "Play with these."--(paper objects) "Play, and cigarette for Daddy."
E. Perseverative Tendency[a] S's response is novel, but within the same culturally-reinforced functional or generic class (e.g., use, color, form, etc.) as a previous response.	(red objects) "Red."--(paper objects) "White."

Note: If more than one subcategory is applicable to a response, the "highest" (i.e., occurring lower in the table) is employed.

[a] Indicates categories or subcategories for which scores were derived.

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