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THE RELATIONSHIP BETWEEN COGNITIVE DEVELOPMENT
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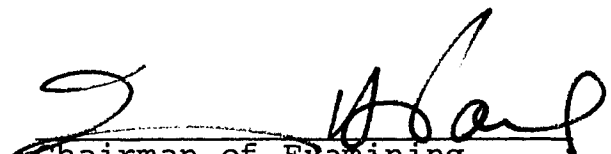
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ABSTRACT

This study attempted to compare the development of thought in five to eight-year-old children, from the perspective of both the Freudian model, of primary to secondary process, and the Piagetian model of preoperational to concrete operations.

The basic premise of the study was that underlying structures would result in correlations between measures of Piagetian and Freudian thought levels.

The sample consisted of thirty-seven white, middle-class children, all of whom had at least one college educated parent. The subjects ranged in age from five years, to eight years eleven months.

Each child was individually tested on two sets of protocols. The first set consisted of eight of Voyat's Piaget tasks, each of which measures the child's task-specific stage of intellectual development. The second protocol was a Rorschach test, which was administered according to Holt's procedures, and scored by an independent clinician.

Eight hypotheses were tested. They stated that constructed measures of Piagetian Development are positively correlated with Holt's (1) Form Level; (2) Defense Effectiveness; (3) Adaptive Regression; (4) Goldberger scores; (5) Pripro Level 2; (6) Content Level 2; and two newly constructed measures of (7) Control-Defense Plus, and (8) Control-Defense Total.

All of the hypotheses, except the Goldberger, were confirmed with significant correlations, using a two-tailed test at the .05 level.

Additionally, an analysis of variance, treating the Piaget Stages as independent groups, yielded significant differences on measures of Form Level, Defense Effectiveness, Control-Defense Plus, Control-Defense Total, and Adaptive Regression. The means of all tested primary process measures increased across each Piaget Stage.

Correlations were performed among the eight individual Piaget tasks, and the two constructed composite scores of Piagetian Development. The correlations of the eight tasks with Piaget Stage and Mean Piaget Score ranged from .65 to .91. A further correlational analysis compared individual Piaget tasks with the composite Piaget Development scores, as predictors of Pripro variables. Only class inclusion emerged as a slightly better predictor than the composite scores.

An analysis of variance revealed no significant differences between boys and girls on any of the Piaget or Pripro variables.

Piaget Stage correlated higher than Age with seven of the eight Pripro variables tested. The differences were significantly higher on four Pripro variables.

Holt's Creativity measure correlated negatively with Adaptive Regression, reflecting pathological rather than

controlled originality.

The findings were regarded as evidence of underlying cognitive structures which result in correlations between Piagetian and Freudian tasks. As Piagetian Development results in the internalization of concrete operatory mechanisms of a secondary process nature, primary process libidinal and aggressive wishful ideation becomes more subtle and socialized, and is expressed through more adaptive controls and defenses.

It is argued that the increase in Adaptive Regression across Piaget Stages, supports both a Piagetian and a revised psychoanalytic model of behavioral adaptivity, in which motivational-cognitive units of structured wishes, representing relative balances of assimilation-accomodation and id-ego, are organized hierarchically along a continuum from unsocialized primary processes to highly organized and socialized secondary processes.

The negative findings of other researchers were differentiated from this study by the narrower age ranges of their samples, which inhibited manifestations of macro-structural differences in cognitive development.

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My dissertation is dedicated to my wife, Sandra, whose care and love have kept me human during its preparation; and to my loving parents.

CHAPTER ONE

INTRODUCTION

Psychoanalytic Theory

Although Breuer, collaborating with Freud (Freud, 1893), had first alluded to the distinction between primary and secondary processes in his discussion of bound versus mobile energies, the first systematic psychological formulation of the two systems was presented by Freud in Chapter VII of his Interpretation of Dreams. He described the primary system there as an unconscious psychological process, frequently revealed in dreams, which operates according to the unpleasure-pleasure principle. It can do nothing but wish, and the "wishful ideation" strives for immediate discharge.

The primary system develops in the unsatiated infant, and strives thereafter to achieve its aim of perceptual identity through the mechanism of condensation (fusion of disparate ideas or images).

The secondary process is described, initially, as maturing "in the prime of life", much after the primary process. It attempts to establish identity in thought, and consequently avoids unrealistic means for immediate discharge. It obeys reality by overlaying and inhibiting the primary process, and can be described as normal, conscious adult thought (Freud, 1900, pp. 600-604).

With that introduction, Freud planted the seeds of understanding the primary process concept from all major

metapsychological perspectives (Rapaport, 1959). From the economic viewpoint, the striving for discharge is mobile and rapid in the primary process, whereas it is bound in the secondary process. Dynamically, the primary process contains basic unconscious sexual "wishful ideation" which is opposed and repressed by the forces of the reality principle. Topographically, the primary process is unconscious and the secondary process is conscious. Genetically, the primary process emerges in infancy, the secondary process in later life. From the adaptive point of view, there is a shift from the ignorance of external constraints, to a concern with thought and behavior which follows the real demands of the world (Gill, 1967). Structurally, the contents of primary process thoughts are expressed by the mechanism of condensation, to which Freud later added displacement and symbolization.

As was Freud's method, in succeeding works he described and expanded his developing understanding of the primary and secondary process, sometimes with slightly different emphases, and within differing contexts. Consequently, several contemporary psychoanalysts have written detailed exegeses attempting a full formulation of these concepts (Rapaport, 1950; Gill, 1963, 1967; Arlow and Brenner, 1964; Schur, 1966; Holt, 1967).

The results of these efforts differ according to each author's point of view. Arlow and Brenner (1964), claim that with the development of Freud's structural theory of id, ego

and superego, the concepts of primary and secondary process were relegated to non-structural, purely energetic concepts: "The concepts of primary and secondary process should be defined in terms of varying degrees of mobility of cathexes (1964, p. 102)." This position completely ignores the fact that each cathexis is experienced and organized through a specific cognitive mechanism.

Holt (1967; 1974), however, emphasizes the formal and structural elements of primary process thought, analyzing condensation and displacement as microstructural mechanisms which organize thought content, whether it be conscious or unconscious, and whether part of the id or the ego. He rejects the economic and dynamic points of view as being mechanistic, and questions of motivational causes and intensity tend to have a minor role.

Gill (1967) provides the most comprehensive view by emphasizing that the flexibility and richness of psychoanalytic theory is enhanced by examining concepts such as the primary process from each of Rapoport's (1959) metapsychological viewpoints. As we have seen, Freud laid the groundwork for this approach in his first discussion of the concept.

Although varying degrees of emphasis have been chosen by contemporary theorists regarding the metapsychology of primary process thought, Holt (1967) attempts to cope with the dilemma by proposing an operational definition which can be used for research purposes.

Primary process is defined as a primitive disordered and illogical type of thinking organized around libidinal and aggressive drives or wishes¹ (Holt, 1967). The more an idea is dominated by blatant aggressive or libidinal content, the more it is primary process. Additionally, the more it contains logical errors, such as condensations, displacements and symbolizations, the more primary process.

Secondary process is defined as a logical, socialized, purposive and realistic type of thinking. The more logical and appropriate, the more secondary the thinking. These definitions imply two criteria for determining the level of thought process. As Holt states:

When Freud (1911) linked the primary process to the pleasure principle and the secondary process to the reality principle, he gave us two independent and empirically useful criteria, which can tell us to decide to what extent any particular manifestation of displacement or condensation approaches the one pole or the other. Thus, the more thought (and also affect and behavior) can be characterized as an unrealistic seeking for immediate gratification, the more it is to be considered primary process; for a specific example, to the extent that cognitive unities are brought about in the service of wish and violate the proper identities of concepts and images, the condensation is of the primary type. And the more thought or behavior is organized by adaptive considerations of efficiency in the search for realistic gratification, the more it approximates the

¹In this paper I will refer to "wishful ideation" or wishes rather than "drives", in keeping with Schur (1966), who distinguishes between the psychological and somatic components, respectively. Additionally, wish is a more operational concept than drive. It is free of metapsychological (economic) assumptions. Finally, wish implies cognitive ideation which is an aspect of all motivational structure (infra).

ideal of secondary process; thus, to the extent that there is a logical progression from one idea to another in a way that respects reality and the internal consistency of thought, the displacement is of the secondary process type. Note that wishfulness and realism are not logical opposites and thus are two criteria, not one; their independence raises the question whether a single continuum suffices for more than a rough-and-ready classification of thought products. As Schafer (1954) has pointed out, thought can notably be lacking in internal consistency, peculiar in logic, and unrealistic without necessarily being particularly drive-dominated. On the whole, however, the criteria do tend to go together (Holt, 1967, p. 294).

This definition suggests that primary and secondary process are two ideal polarized states along a continuum of thought, rather than rigidly bounded dichotomous entities. Such is the view of Holt (1967), Gill (1963), Schur (1966), and Freud (1900, p. 603).

Primary process thinking, as originally conceived by Freud was primitive, unrealistic and regressive. He generally considered its manifestation to be the result of a failure of the ego to effectively perform its inhibiting function (Freud, 1900; but see Freud, 1905). However, contemporary ego psychologists, after Kris (1952), have stressed the ego's adaptive use of primary process material, which is found in jokes, creativity, and relaxing fantasy.

Kris termed this usage of primary process "regression in the service of the ego." Holt (1960) describes this function as "adaptive regression." Thus, not only must primary process thought be evaluated in terms of its content (libidinal and aggressive wishes), and its logical structure, but also

the dimension of adaptive-maladaptive use is necessary.

The adaptive use of primary processes presents a problem for those who would like a unidimensional model of thought development. Adaptive regression implies that both primary and secondary processes are present in the mature person. One determinant separating mature from immature functioning, then, is the extent to which one can flexibly control his primary process products, and integrate them successfully with realistic needs.

A rigidity of ~~personality~~ would characterize one who has no access to primary process fantasies and wishes. An impulse disorder or psychosis might describe a person who is flooded with uncontrollable, blatant and illogically expressed sexual and aggressive wishes. On the dimension of adaptive regression, both artists and schizophrenics would have strong access to primary processes; but the difference would be in their ability to successfully control and mold the material in a socially acceptable and creative way (Goldberger, 1958).

The control of wishes essential to adaptive regression, again raises the question of the metapsychology of thought. Gill (1963) argues that when any discharge or wish becomes regular and habitual, it becomes structured whether the discharge originates in the primary or secondary process. This is in accord with Hartmann, Kris and Loewenstein (1964), who stress that all structures are defined by the functions that

are attributed to them. The implication of this viewpoint is that desires are organized in hierarchical wish-control units. Each structure inhibits the preceding one, and serves as the motive for the next controlling structure (Gill, 1963).

The extent to which these primary process wish-controls are compatible and integrated with mature aims and structures, the more they will be available for adaptive regression functions (Lichtenberg and Slap, 1971).

The hierarchical model of cognitively organized motivation suggested by Gill is not new with him. Among others, Woodworth (1918) and Hebb (1954) emphasized that physiological motivational states must be related to "meanings" in order for behavior to occur. Klein (1970) integrated the cognitive component into his notion of drive, after his experimental studies with thirst motivations demonstrated both that thirst affects cognitive behavior, and that cognitive attitudes affect the experience of thirst. He concluded that,

Because cognitive attitudes describe a person's typical accommodative patterns in dealing with reality, they are best viewed as integral aspects of his drive structures; they are initiated by any intention (not necessarily conscious) that calls for realistic appraisal and assessment. Behavior then, embodies priming, recruiting, and accommodative functions. Drive aim, drive consummation, and mode of cognitive control are simply different vantage points from which to view the same behavior (Klein, 1970, p. 208).

The motivation-control unit provides a theoretical basis for rating both the content of a Rorschach blot image (based upon the "shock" value" of the implied wish), as well

as the structure (based upon the form level and defenses). From this, Holt (1970) derived his operational definition of adaptive regression, by comparing the blatancy of each Rorschach content with the effectiveness of its form (infra, p. 36).

Piagetian Theory

Piaget's theory develops from the following epistemological assumptions: (1) There is a necessary and logical succession of stages in development. (2) The stages proceed from the simple to the complex, with the latter stages encompassing the former. (3) The developmental stages can be described by formal abstractions, a structural "logic" which implies corresponding functions. Each stage of cognitive development has a unique structure, which is self-sufficient, contains a system of transformations, and is self-regulatory (Piaget, 1970).

The sensorimotor stage, which exists before language develops, is organized by a "logic of actions". Actions are organized into patterns which enable a child to distinguish between means and ends, in active non-symbolic interactions (Voyat, 1975).

The preoperational stage, from approximately two to seven years, is characterized by egocentric yet symbolic intelligence. During this period, intelligence becomes reorganized and mediated through symbolic, though personal forms.

Language is of great assistance in the symbolic reorganization of intelligent actions.

Concrete operations, which develop during the latency years, are organized by the logic of invariance, and allow the child to conserve matter, space, time and number. The new operations enable a child to better understand the physical relationship between himself and the external world, as well as to understand and control relationships between external objects.

Formal operations begin by the age of eleven. This stage provides operations which permit the construction of both abstract and non-existent relationships, rather than being limited to the "concrete" world. The formal child or adult is able to play with his mind (Voyat, 1975), to make theoretical hypotheses and conclusions, and to think about thinking.

Since the subjects in this research are latency age children, we turn now to a closer examination of the operative laws and properties of concrete operational intelligence. Concrete operations are organized according to the principles of the mathematical "group" discovered by Galois in the nineteenth century (Piaget, 1970). The two principle operations which characterize this group are reversible transformations (Piaget, 1969). These may either be inversions, such that $(+A - A) = 0$; or reciprocal reversibility such that $A < B$ is reciprocated by $B > A$. For example, if one throws away

all of his toys, he has none left (inversion). If one crumples a piece of paper, it is shorter but higher (reciprocal reversibility).

When concrete operations are manifested in operations on classes, the following additional properties describe the way the elements may be combined (Ginsburg and Opper, 1969; Piaget, 1969). The first property is composition or closure, which states that if two elements of the system are combined, the result is another element in that system. For instance, if yellow roses are combined with other colored roses, we get the total class of roses. This may be written as $A + A' = B$.

The second property is associativity. Three groups of different colored flowers can be added together, by first adding the first two groups, and then combining the sum with the remaining group. Since concrete operations are binary, only two groups may be added at a time. Mathematically, this is stated $(A + B) + C = C$.

The third property is that of identity, such that $A + 0 = A$. The fourth property is negation or inversion referred to (supra), such that $A + (-A) = 0$. The fifth property is tautology, such that $A \equiv A$. Tautology differs from identity in that it is a definition rather than an operation.

The equations described in this group are interrelated and they allow the child to perform basic concrete operations. For instance, there is one Piaget task called conservation of matter (Piaget and Inhelder, 1969). In this task,

two balls of clay having the same amount of matter and the same shape are presented to the child. After the child agrees that they are "the same", one ball is transformed into a hotdog. A concrete operational child will still organize his perceptions such that he conserves the identity of matter. He might justify his belief in one of several ways, based upon the equations just described.

First, the child may justify the conservation by the principle of additive identities: "It is the same clay. You just changed its shape. Nothing has been added or taken away." Secondly, the child may justify the conservation using reversibility by inversion: "You can put the clay in the hotdog back into the ball like it was before." Finally, the child may justify the conservation by compensation, or reversibility by reciprocal relationship: "The hotdog is longer, but the ball is higher."

Another Piagetian task that uses these transformations or operations even more explicitly is entitled class inclusion (Piaget and Inhelder, 1969b). In this task, the child is given ten sheep and two horses. After agreeing that the horses and sheep are both animals, he is asked whether there are more sheep or more animals. This requires understanding of the inclusion $A < B$. Other operations involved in the task involve subtracting the horses from the cows, and subtracting the animals from themselves (closure and identity).

The stage of concrete operations is clearly an advance over preoperational thought, when the child reasoned without reversible transformations. The preoperational child focuses upon states rather than transformations. He would conclude that there is more matter in the hotdog because it is longer, or that there is more matter in the ball because it is higher. He would not be able to decenter from the two static positions of the clay, and thus could not reason in terms of invariance and transformational logic.

The transitional child has advanced in logic over the preoperational child, in that he can understand the possibility of transformations of concrete objects, obeying mathematical laws of the operational group; but these principles are not intrinsic and necessary explanations. Consequently, he may justify the conservation of matter in the two clay balls by identity, or reciprocal reversibility at one minute, and then the next minute negate these possibilities by claiming that the balls really do have a different amount of matter. It is only when conservation is a logical necessity, rather than a possibility, that a child has achieved conservation, because, now, he understands the meaning of a transformation in terms of what is left invariant during the operation.

The concrete operational child has greatly increased abilities to understand reality. The logical system he constructs enables realistic understandings of time, space, causality, class, and other Kantian categories. Yet his

reasoning is still not fully developed. During the stage of formal operations, which usually begins by the eleventh year, the child will begin to reason abstractly as well as concretely. The child will then be able to imagine hypothetical tasks and conclusions; to perform operations upon operations (combinations), as well as to verbalize the rules of logic that previously had structured his concrete intelligence, albeit on an unconscious, inarticulated level.

Although the logic of concrete operations is evident at an early age, as manifested by the child's ability to conserve number at the age of five (Piaget, 1969), the transformations do not generalize to all concrete operations until the eleventh year. Piaget calls this lag of generalization "horizontal decalage" (Piaget, 1969). One-to-one correspondence is usually achieved at the age of five; conservation of matter at the age of seven; horizontality of water levels at the age of ten, and conservation of volume at eleven years of age.

Piaget stresses that horizontal decalage reflects the particularity of concrete operations. Manifestations of this structure are limited to specific situations which the child cannot deduce from abstract hypotheses. However, the contradictions created by conservation on one task and failure on another, tend towards a more stable equilibrium in which conservation remains an invariant.

Although Piaget emphasizes structure, he does not ig-

nore the problem of motivation, as the last sentence implies. Piaget hypothesizes that all organisms have two "invariant functions" (Piaget, 1952): Organization is the tendency towards both physical and psychological structural development. Adaptation is the tendency to adjust to the environment. Adaptation itself can be broken down into two components: Assimilation and accomodation.

A person may either assimilate new experiences to his already existing psychological structures; or he may accomodate and change his structures to adapt to the new experience. All behaviors necessarily involve a mixture of the processes; however, equilibrium is achieved only when there is a stable balance between them.

The preoperational child has a disproportionate tendency to adapt through assimilation rather than to accomodate himself to reality. Consequently, he is increasingly motivated to achieve greater stability by changing his schemas when they are not congruent with new situations. When the conflict emerges from the interplay of two similar operations, horizontal decalage occurs. When the conflict exists between two groupings, then a vertical decalage exists. The resolution of these conflicts leads to the development and generalization of new structures, which provide a more stable balance between assimilation and accomodation.

In addition to the "desirability" of resolving conflict and achieving cognitive equilibrium, Piaget recognizes that

affects and wishes are organized in hierarchical affective-cognitive structures, as do Gill and Klein:

We have assumed that affective decentering is a correlate of cognitive decentering, not because one dominates the other, but because both occur as a single integrated process (Piaget, 1969, p. 26).

Relationships between Psychoanalytic and Piagetian Theory

Freud had created his theory of thought development from observing neurotic adults in psychoanalysis. Piaget had created his ideas from working directly with normal children. Freud focused on the conflicting needs of the person, and the attempts to resolve those conflicts. Piaget concentrated on conflict-free cognitive structures. Although obvious differences emerged in their theories, the similarities are striking, and will briefly be considered from a metapsychological perspective.

Both theories ascribe to a genetic point of view, which postulates successive hierarchical layerings of cognitive structure. Additionally, both for Piaget and the ego psychologists, these structures organize both ideation, motivation, and affectivity. Both the Piagetian and the Freudian macrostructures are biologically programmed, but need an average expectable environment (Hartmann, 1939) and proper alimentation (Piaget, 1952) in order to develop.

Both theories postulate a dynamic viewpoint, in which behavior emerges from a conflict between opposing forces.

Freud describes these as the pleasure principle, which regulates primary process; versus the reality principle, which regulates the secondary process. Piaget conceptualizes the battle between assimilation of new realities to old structures; and the accommodation of old psychological structures to new realities. In both models, the child is seen as developing increasingly reality oriented structures as he grows.

Topographically, both Freud (1900) and Piaget (1952) subscribe to the position that unconscious thought mechanisms govern intellectual and emotional behavior. Thus, for Piaget (1969), one step in the transition from concrete to formal operations is making conscious the rules which govern concrete transformations.

Additionally, both theorists ascribe to an economic point of view, although the congruence of the models is a controversial issue. Rapaport (1960), for example, believes that Freud's concept of drive reduction is supplemented by the necessity for nutriment from the environment to maintain ego and superego structures. This position is analogous to Piaget's (1952) recognition that a disequilibrium between accommodation and assimilation results in the need for aliment from the environment for structural development to occur.

Holt (1967a) emphasizes the mechanistic, homeostatic aspects of Freud's drive reduction model, and recently (1974) urged psychoanalysts to consider the Piagetian model in its place. Clearly, psychoanalytic theory is moving away from a

rigid interpretation of Freud's energetic concepts and towards a reconciliation with Piaget.

From the standpoint of structure, Piaget and the ego psychologists both complement and enhance each other's conceptions. Both theories postulate necessary regulatory mechanisms which organize and control observable behavior. In addition to Piaget's operatory macrostructures, and Freud's id, ego and superego, each theory posits analogous microstructural mechanisms through which thought is expressed.

For example, condensation, displacement and symbolization are described by Piaget (1928) as juxtaposition, syncretism and transduction. Piaget specifically acknowledges his debt to Freud in discovering these processes, although Piaget was the first to empirically demonstrate their presence in the thought of children. From the comparison of these microstructural mechanisms, we see the structural parallel between the preoperational stage and the id.

Furthermore, Piaget's theory helps to clarify two structures on the continuum of secondary process thought. The concrete operations define a set of secondary process structures which operate according to the reality principle. Yet the formal operations are imperative for abstraction, which Freud (1940) emphasizes in the hallmark of secondary process thinking.

The last metaphysical point of view to consider is the adaptive one (Rapaport, 1959). Psychoanalysts postu-

late that the adaptivity of every behavioral unit emerges from the relative convergence of primary and secondary process elements (Hartmann, 1964). Likewise, Piaget (1952) emphasizes that every behavior contains elements of assimilation and accomodation. Although the two dichotomous processes are not identical, it is clear that the less mature the child, the more assimilation and the pleasure principle will dominate; conversely, the more mature the child, the more accomodation and the reality principle will dominate behavior. The relative balance or equilibrium of behavior which emerges is what Piaget calls adaptation and what Holt describes as adaptive regression.

Since manifestations of primary processes will be measured through the medium of the Rorschach test in this research, it would be useful to consider briefly the relationship between Piaget and psychoanalytic concepts of perception. Piaget (1969), as well as Werner (1948), have both found from their studies of childhood perception, that preoperational children perceive in a global and syncretic fashion. They anticipate only static perceptions, and cannot form images of transforming percepts.

The change from syncretic globality to differentiated and integrated kinetic images parallels the development of concrete operations. The concrete operational child is much more active in his perceptions. He sees vivid, kinetic imagery, which enables him to decenter his attention from

static states, and pay attention to operatory transformations. Thus, in conservation of matter, the operational child can anticipate, recall, and shift his perceptual attentions as the clay transforms from a hotdog to a ball.

To those who might argue that concrete operations are merely a function of perceptual maturation, Piaget (1964) marshals several arguments. One is that perception serves a decentering and compensating function as early as the second year, when the child is able to maintain size constancy and object permanency, despite physical transformations. However, the equivalent adaptation of this principle to the intelligent perception of matter, length, area and number conservation, does not occur until the concrete operative laws are internalized.

Psychoanalytic theory also has a model of perceptual development, although not as explicit as that of Piaget. Recall Freud's (1900) original definition of the primary process, which he characterized as striving to achieve an identity of wish and perception. Gradually, as the child moves towards secondary process thought, wishes no longer attach themselves to perception, which becomes a more effective reality testing function of the ego.

Hartmann (1939) expanded upon Freud's (1923) ego psychology, to postulate that perception is an ego apparatus of primary autonomy, which exists in the undifferentiated phase of ego development, and later develops into a major control

apparatus. Furthermore, other ego controls and defenses achieve secondary autonomy through developmental integration with perception and other ego functions of primary autonomy.

Rapaport's (1967) concept of relative ego autonomy helps to clarify the psychoanalytic theory of perception. The relative autonomy of perceptual ego apparatuses insures that during waking hours adults will generally perceive in a realistic fashion, regardless of their desires and wishes. For example, most adults will not hallucinate non-existent food if they are hungry. Their perceptions will also be organized according to the Gestalt laws of good form. Nevertheless, under conditions of deprivation, primary process wishes will dominate perception, as in desert mirages.

Between the extremes of hallucination and objectivity, the relative autonomy of perception implies that individuals will tend to develop perceptual styles which are consistent with their primary process wishes. Thus, obsessive people will show special alertness for unusual details, whereas the perceptual style of the hysteric would be to ignore or level such annoying differences in a visual field (Klein, 1970).

Comparing the Piagetian and psychoanalytic theories of perception, we see that both hypothesize that perception will become increasingly realistic and stable with development. Both theories further anticipate that mature styles of perception will become integrated with other mature cognitive-

motivational structures. Finally, each theory recognizes that the relative balance between wish and accomodation will vary, not only across cognitive stage, but intraindividually from behavior to behavior.

Before considering previous research studies, it is necessary to clarify the role of defense mechanisms in the two models of cognitive development. In accordance with the structural emphasis of ego psychology, defense mechanisms will be considered herein as a subtype of control, which specifically distorts or inhibits libidinal and aggressive wishes (Lichtenberg and Slap, 1971). Defense mechanisms are adaptive to the extent that they are integrated with congruent autonomous cognitive structures, rather than remaining developmentally split off.

Thus, Hartmann (1964) considered that defense mechanisms "may be patterned after some autonomous preliminary stages of ego functions, and after processes characteristic of the ego apparatus (p. 82)." Rapaport (1957), likewise stated that both "cognitive style and defense mechanisms are tools of cognition, used primarily in its dealings with the internal needs of the organism (p. 634)." Klein (1964) demonstrated that defense mechanisms, such as repression, were correlated with individual's autonomous ego functions, i.e., cognitive style.

The cognitive aspects of defense mechanisms can be specified, clearly. For example, projection, even in its most primitive form, requires the cognitive recognition of

subject-object differentiation. Likewise, intellectualization requires a level of secondary process thinking congruent with Piaget's stage of formal operations. Accordingly, we would expect specific defense mechanisms to emerge and correlate with more general cognitive patterns of functioning such as perceptual form level in the Roschach test, and with Piaget's stages of operational development.

In this brief comparison of Freudian and Piagetian models, several theoretical positions have been stated. First, both theories share complementary metapsychological viewpoints, particularly in their hierarchical models of affective-structural units. Additionally, the Piagetian preoperational stage has added clarity to structural aspects of the primary process; while the concrete and formal stages have been shown to necessitate a continuum from primary process to advanced secondary process.

Moreover, both theories share analogous conceptions from the adaptive point of view. Without equating them, both adaptive regression and adaptation are specific behavioral expressions of a relative balance between contradictory demands of inner and outer presses.

Additionally, we have seen that both the psychoanalytic and the Piagetian conceptions of perception have similar developmental hypotheses about the increasing congruence between perception and reality, and the integration of perceptual functions with mature cognitive structures.

Finally, the defenses have been considered as a sub-

type of cognitive control, which would lead to the expectation of correlations between the development of Piagetian structures and defense mechanisms.

Empirical Studies

Several studies have attempted to understand children's thought processes through the use of the Rorschach protocol. The most comprehensive developmental study is that of Ames et al (1952), who compared the Rorschachs of hundreds of children, divided into groups by their yearly ages. She found that several formal indicators of thought deviations decreased with age during the latency period. These included perseveration, confabulation, and contamination.

Likewise, Thorpe and Swartz (1965; 1966) found that logical errors in thought decreased with age. Their comprehensive study tested 360 normal subjects at three criterion age: 6.7, 9.7, and 12.7 years of age. Age-group differences beyond the .001 level of significance were found for seven of the eight variables studied. These included form appropriateness, form definiteness, integration, movement, human, color, and pathognomic verbalization.

Goodman (1965) asked boys in the first four grades of school to make up stories. He then scored the stories for drive related primary process content, using a variant of Holt's manual. He retested the boys two years later. Goodman's results may be interpreted to mean that an increase in

primary process wishes correlates with development. He found no curvilinearity of wishes related to age or Freudian stage.

Safrin (1974) studied three groups of twenty-one subjects each, in the oedipal, latency, and adolescent stages of Freudian development. The first group were four and five year olds. The second were eight and nine year olds, and the third group were thirteen and fourteen year olds. She hypothesized that (1) the amount of primary process would be lowest in the latency sample; (2) that the proportion of primary process responses containing unsocialized, blatant material would decrease with development; (3) that Defense Effectiveness would increase with development; and (4) that there would be an increase in the varieties, but not the quantity, of formal thought deviation with development.

Hypothesis 2 was confirmed. Hypothesis 3 was partially confirmed in that there was a significant increasing linear trend on Defense Effectiveness. Hypotheses 1 and 4 were not confirmed. In fact, a post hoc analysis revealed a significant decreasing trend in logical thinking errors, and a significant increasing trend in the amount of primary process content.

Matalon (1974) recently completed the most relevant study of children's primary process thought for my research. Working with data collected from fifty-six middle-class, white, ten-year-old children from Montreal, she compared

their Rorschach results, using Holt's system, with their scores on eleven other measures of intellectual, cognitive, motor, school achievement and personality functioning including eight Piaget tasks. Additionally, Matalon compared her sample of children with previously obtained adult Rorschach scores, in an attempt to discern quantitative and qualitative differences in thought between them.

Matalon hypothesized that good cognitive functioning, as measured by the Piaget tasks, would be positively related to differing degrees of well defended primary process, and negatively related to varying degrees of poorly defended primary process. She also hypothesized that well defended primary process would be correlated with high motor proficiency, high W.I.S.C. scores, good school achievement, low anxiety and high emotional and social adjustment.

Matalon's findings did not support any of the major hypotheses she formulated. Furthermore, a correlational study between the individual aspects of primary process functioning, as measured by the Holt system, including measures of libidinal and aggressive wishes, formal thought deviations, Defense Demand, Defense Effectiveness and Adaptive Regression, failed to correlate with good cognitive functioning.

In fact, the only significant correlation related to cognitive functioning was a negative relationship between Defense Effectiveness and high Piagetian performance. Matalon was surprised at this result; however, she pointed out that

it might be discounted to chance because of the high number of correlations performed. The study did present evidence that a significantly greater number of boys than girls were manifesting large amounts of well-defended primary process.

The second major part of Matalon's study, the descriptive comparison between primary process thought in children and adults, yielded striking differences between the two groups. The adults produced a higher amount of total primary process thinking, as well as higher amounts of primary process when this was broken into two groups of primitive and socialized manifestations. Additionally, the adults also expressed more formal thought deviations, and more libidinal and aggressive wish content. Qualitatively, the children evidenced fewer modes or subtypes of primary process manifestations than the adults.

Matalon concluded from her study that in middle childhood, primary process and secondary process functioning, the latter measured by the Piagetian tasks, do not overlap but are autonomous systems. She also suggested that defenses of primary process thinking do not seem to be integrated with other cognitive controls to be used in intellectual tasks. Finally, the idea of adaptive regression as a meaningful concept for children's thought, was questioned.

Matalon's results were surprising both in terms of theory and previous empirical studies. Safrin's finding of a significant increase in defense effectiveness with age

(although there was a curvilinear pattern also) seems to be in direct conflict with Matalon's data. Thorpe and Swartz' finding that logical errors decrease with age, confirmed by Safrin, implied a significant relationship between cognitive development and defense effectiveness, as well as adaptive regression.

Matalon's data conflict with both psychoanalytic and with Piagetian theory. From the preceding analysis of thought development proceeding through a hierarchy of wish-control units (supra), the theoretical foundation has been constructed which implies that as cognitive development increases, primary process manifestations become more socialized, structured, and better controlled and defended. In the specific area of Rorschach tests, a theoretical analysis of developmentally structured changes of perception, dependent upon cognitive growth, has given support to the proposition that this theory would be operationalized through Rorschach percepts.

The exposition of Piagetian theory has also suggested that the intertwining of cognition and motivation also proceeds in structured progressions. Consequently, in trying to understand Matalon's results, it is incumbent upon us to examine her methodology. There is a striking difference between the design of Safrin's research and that of Matalon, which might begin to explain the opposite trends that they found in the direction of Defense Effectiveness.

Safrin studied children's primary process development across a wide age span, which allowed gross differences between the age patterns to be highlighted. Matalon studied differences in primary process and cognitive functioning across children in one age year and one grade, which would have tended to minimize gross differences in structure. By the age of ten years, as Matalon pointed out, the upheavals of both oedipal and preoperational stages have subsided, and the period of formal operations and adolescence has not yet begun.

Thus, it is possible that differences within and between subjects are heavily influenced by microstructural differences in style and expression, rather than by major macrostructural reorganizations. These microstructural differences were likely to be highlighted by Matalon's rating technique of Piagetian tasks, in which children could score up to eighteen points on each task. By this method, large differences in scores could be obtained with children who would all be at the same Piagetian stage.

Rabie and Dudek (Dudek, 1975) likewise attempted to compare cognitive and wish-related performance, in a study of forty first-grade children. Using an adaptation of Holt's manual, they scored for levels of primary process wishes in T.A.T. stories. Although most correlations were non-significant, the authors found a negative relationship between W.I.S.C. intelligence and Level 1 unsocialized primary pro-

cess wishes. An additional finding was a significant negative relationship between overall primary process thinking and reading comprehension, as measured by the California Achievement Test, a result they discounted to chance.

These findings can be explained, as Matalon's, by the age range of the sample. In designing the research for this study, which will challenge the Matalon and Rabie-Dudek results while agreeing with their hypotheses, careful attention will be paid to this difference in design between their studies and the Safrin study.

In addition to the previously described research on primary process thought development, another group of studies focused on the relationship between creativity and Holt's Adaptive Regression measure. Silverman (1963) worked with forty-one eight and nine-year-old children who were given a creative task to perform (painting) and asked to talk while they worked. The paintings were independently evaluated for creativity.

She found that there were significant correlations between individually creative paintings and an adaptive regression analysis of the child's speech while painting them. However, there were no significant correlations when each subject's work was combined into an average score. Apparently the attention and involvement of the children created individual differences.

Rogolsky (1968) attempted to discover a significant

relationship between creativity and adaptive regression in third grade children. After an independent rating of the children's drawings, the most and least creative children were divided into two groups. Holt's measure of adaptive regression did not differentiate the two groups. However, a post hoc analysis, which created a new measure of adaptive regression, did unsuccessfully distinguish the two groups. The old method was based upon the standard relationship between Defense Demand and Defense Effectiveness. The new measure added the factor of the number of popular responses to the rating of defense control.

Newmeyer (1972), working with twenty-five black children between the ages of nine and twelve, found that there was a significant correlation between creativity and adaptive regression, as measured by the Holt system. He used several sources for measuring creativity, but relied primarily on a rating of the Rorschach percepts themselves, which he recognized as a problem in establishing independence between the two measures. Newmeyer additionally found no significant differences between blacks and Rogolsky's white children on adaptive regression.

The three major studies investigating the relationship between creativity and adaptive regression seemed to achieve ambiguous results (Dudek, 1975). The hypothesized relationship is an interesting one to consider. However, our theoretical analysis of adaptation, both from a Piagetian and Freudian perspective, has suggested that these concepts may

correlate more with motivational-cognitive development, rather than with creativity, which may be more of an independent factor.

Although the Matalon research is the only one published in which primary process manifestations are compared with Piaget tasks, many cognitive studies have been reported which replicate and extend Piaget's research. Elkind (1961) has replicated most of Piaget's conservation studies, finding, among other results that matter and weight are conserved by the majority of children at the ages of seven and nine years, respectively. Lovell and Ogilvie (1961) have replicated the volume conservation tasks, which have a peak achievement at the age of eleven. Verbal seriation has been studied also, with the majority of children concrete operations by the age of ten. Pinard and Laurendeau (1964) describe twelve additional studies which replicate Piaget's findings on conservation tasks.

Regarding the relationship between perception and concrete operations, O'Byran and Boersma (1971) tested ninety-two girls, ages six to ten-years old, on conservation of length, area and quantity, while they recorded their corneally reflected eye movements. Subjects were then classified into preoperational, transitional and concrete operational conservers.

The results indicated that substantial eye movement pattern differences occurred between conservers and non-con-

servers, as well as between the nonconservers groups.

O'Bryan and Boerman concluded that the data support the theory that perceptual activity and decentration occur in relationship with the achievement of concrete operations. The research suggested also that, in the presence of the transformed stimulus, nonconservers are distracted by the dominant perceptual clues that are usually irrelevant to a conservation judgment. However, the conservers seemed to adopt a scanning strategy so that their judgment was not based on only one dimension nor distorted by the irrelevant perceptual cues.

Many recent Piaget researchers have concentrated on the extent to which his stage theory applies to racial and socioeconomic groups (Ham, 1971; Stokes, 1971). Stokes, in a study of 128 Midwestern, urban children from five to eight-years-old, found significant socioeconomic and racial differences among the children on conservation, seriation and classification. Although these results do not discredit the theory of invariant stage sequences, they are an impetus for controlling class and race variables in the present research.

Hypotheses

In accord with the theoretical and empirical considerations suggesting developmental relationships between Piagetian cognition and primary process ideation, the following hypotheses were tested on a sample of thirty-seven five to eight-year-old children, using Voyat's (1976) Piaget protocols and Holt's

(1970) primary process manual (infra, p. 36).

1. Piagetian Development is positively correlated with more socialized and subtle expressions of primary process material, as measured by Pripro Level 2.

2. Piagetian Development is positively correlated with more socialized expressions of libidinal and aggressive wishes, as measured by Content Level 2.

3. Piagetian Development is positively correlated with perceptual structure, as measured by Form Level.

4. Piagetian Development is positively correlated with structured and controlled expressions of primary processes, as measured by Defense Effectiveness.

5. Piagetian Development is positively correlated with highly effective defense mechanisms, as measured by Control-Defense Plus.

6. Piagetian Development is positively correlated with effective defense mechanisms, as measured by Control-Defense Total.

7. Piagetian Development is positively correlated with regression in the service of the ego, as measured by Adaptive Regression.

8. Piagetian Development is positively correlated with regression in the service of the ego, as measured by the revised Goldberger score.

CHAPTER TWO

METHOD

Sample Selection

The subject population was chosen from the Upper West Side of New York City, bounded by Riverside Drive, Central Park West, 72nd Street and 116th Street. The thirty-seven subjects were white middle-class children between the ages of five years no months, to eight years eleven months.

Fifteen boys and twenty-two girls were individually tested. Their distribution by Piaget Stage is described in Table 1.

TABLE 1

Sex by Stage Comparisons of the Sample

Piaget Stage	All		Boys		Girls	
	N	%	N	%	N	%
Preoperational	9	24	3	20	6	27
Transitional	18	49	7	47	11	50
Concrete	10	27	5	33	5	23

Each child was administered first a battery of eight Piaget tasks, using the Voyat (1975) protocols. A Rorschach was then administered, following the Holt (1970) method, which involves a detailed determinant and affect inquiry at the end of the ten cards. Each testing period lasted approximately

two hours.

Two ways of obtaining the subjects were used. First, mothers of prospective subjects were approached in city parks and streets. After the research was explained, they would be handed a written explanation and a consent form (Appendix B). The second approach was to advertize for subjects in community newspapers. All parents were offered feedback on Piaget's theory and how it applied to their children.

The selection method was somewhat flawed in that the parents of subjects were self-selecting, and the controlling variables too limited. This was necessitated by the difficulty of finding a satisfactory subject pool.

However, it must be emphasized that if the subject pool were more rigorously homogenous, and the variables more tightly controlled, it is likely that better results would be achieved, because there would be less distortion from intervening irrelevant variables. From one point of view, the relative lack of rigorous control of the sample selection would tend to make significant results even more meaningful, while providing a rationale if the hypotheses had been disconfirmed. Additionally, the correlational design called for intra-correlations between each subject's Piaget and Rorschach scores, so that individual differences would tend to balance out for each subject.

The method of age selection was determined by the goal of finding three groups of preoperational, transitional

and concrete operational children. This researcher began testing eight-year-old children until a group of ten concrete operational children were found. Then, younger and younger subjects were tested until a group of approximately ten preoperational children had been identified. The transitional group, larger than the other two (Table 1) was composed of the remaining middle subjects.

Measurement of Primary Process

Primary process categories were measured by Holt's (1970) primary process manual. (See Appendix A for a list of abbreviations.) Each Rorschach response is scored individually for Form Level (FL), a measurement of perceptual structure, on a scale of one through seven, after Mayman (1970). The ratings mark differences between sharp convincing forms; popular forms; reasonably plausible or vague forms; amorphous responses; spoiled form responses, and arbitrary responses.

Each Rorschach response is also rated for Creativity, on a scale of one through five. This measure is designed to be independent of other scores, particularly that of Form Level. Rather, it is based on the statistical likelihood and richness of the response. Creative responses could range from bizarre schizophrenic responses, to subtle and well-integrated expressions.

There are two types of primary process scores. A

response with libidinal or aggressive content (an implied wish) is scored as Content. The libidinal content might express a percept related to oral, anal, phallic, homosexual or voyeuristic wishes.

The second category of primary process scores are those which involve deviations from logical thinking. For example, a percept which fuses two images that are not fused in the external world is a type of condensation which is given a Formal deviation score. Likewise, arbitrary combinations; displacements; symbolism; and affective or logical contradictions all receive Formal scores.

Each Content or Formal score is also placed into one of two Levels of primary process, representing degrees of closeness to the primary process pole. Level 1 is more primitive, blatant, shocking. Level 2 is more socialized, integrated and subtle. It is also arguably more structured and closer to secondary process thought, in the sense that Level 2 processes are more congruent with civilized forms of expression.

Each Pripro (primary process) score is then examined for specific control or defense mechanisms. Although Form Level gives a rating of structure over all percepts, the Control-Defense category specifies particular defense manifestations in Pripro responses only, such as remoteness; delay; reflection; rationalization; projection; and contextual defenses such as humor or intellectualization. Each defense

is described as it appears, followed by a plus, minus, or neither, depending on whether it contributes to, detracts from, or has little effect on the control of the related primary process expression.

For this research I designed two defense mechanism measures, from minor adjustments of the Holt manual. The number of positively rated Control-Defense scores were added in each record, and divided by the number of Rorschach responses to make a "Control-Defense Plus" percentage score.

Additionally, both the positive and non-negative Control-Defense scores were added and divided by the number of Rorschach responses to form a "Control-Defense Total" percent rating. It was expected that the second measure would be more sensitive to emerging defense mechanisms which would correlate with cognitive development, but would not be non-adaptive.

The next two ratings are those of Defense Demand (DD) and Defense Effectiveness (DE). Defense Demand is rated from one to six, depending on its shock-value, or the degree to which it demands controlling measures to make the response socially acceptable. To some extent, there is overlapping between Defense Demand and the rougher categories of Level 1 and Level 2 Pripro.

Then Defense Effectiveness is rated in half-steps, from +2 to -3. Positive values indicate good control in effectively handling the Pripro Defense Demand. Negative

values indicate more pathological and unsuccessful efforts at control and defense of the primary process demand. Defense Effectiveness is evaluated partially on the basis of Form Level, in addition to accompanying affect, adaptive defenses, and general clinical judgment.

The next score, Adaptive Regression, is created by multiplying the Defense Demand by the Defense Effectiveness for each response, and dividing by the total Pripro responses to arrive at an average score for each subject. Positive scores indicate adaptive regression, while negative scores indicate maladaptive regression, both for the individual response and the average protocol score.

The final measure, a variant of the Adaptive Regression measure, is a modification of Goldberger's (1958) Control of Primary Process score. The Goldberger method divides the subjects into four groups. Those with high amounts of primary process and high amounts of effective controls are "mature." Those with high amounts of primary process and low levels of control are "poorly controlled." The group with low amounts of primary process and high levels of control are "rigid with controls." The fourth group of subjects, with low amounts of primary process and poor controls, are labelled "rigid with breakthroughs." The high and low ratings are created by rank ordering all subjects on amount and control of primary process and dividing each measure into high and low groups.

Goldberger's original measure was designed for adults, who scored a wider range of Defense Demand and Defense Effectiveness ratings than do children. Although Matalon (1970) had attempted to compensate for this difference in her study by lowering the rating requirements for a "good control" score, she encountered difficulties in arriving at a meaningful ranking of those who had low amounts of primary process and low amounts of effective controls (p. 258).

Therefore a more differentiated Goldberger measure was attempted by using Defense Demand as a measure of the amount of primary process, and Defense Effectiveness as a measure of effective control, which increased the similarity to Holt's Adaptive Regression measure, except that a ratio and four groups were used, a la Goldberger. The subjects were divided first into two groups of high and low Defense Demand; then into two groups of high and low Defense Effectiveness, based upon a rank ordering of the respective scores. They were then placed into the four Goldberger groups.

Totals for all primary process scores are added and averaged, using the Holt manual. The result is a series of scores for each protocol including the Sum of Primary Process Responses (EPPR); the average Form Level (FL); the mean Creativity; Content Level 1 per cent (of Rorschach responses); Content Level 2 per cent; Sum Content (Content 1 + 2) per cent; Formal Level 1 per cent; Formal Level 2 per cent; Sum

Formal (1 + 2) per cent; Aggressive Content per cent;
Libidinal Content per cent; Pripro Level 1 per cent; Pripro
Level 2 per cent; Sum Pripro (Pripro 1 + 2) per cent; Defense
Demand (DD) average; Defense Effectiveness (DE) average;
Goldberger score, and average Adaptive Regression (DDxDE/PPR).

To illustrate the Pripro scoring technique, I will
present a response scored by Holt from his manual (1970, p.
115):

Card IV.

1. Looks like some kind of monstrous insect. Two
huge feet, big tail. Spindly arms. Very small and
odd shaped head and slit eyes. I think that describes
it. (W FCh A)

Inquiry

1. (Where are the eyes?) (pause) (In here?) yes.
(And what made it look like an insect?) The shape,
general outline. (Anything else?) Perhaps the
shading of different tones of black. (Pleasant or
unpleasant?) Unpleasant. (Why?) It's ugly.

Holt rated the Form Level of this response as "four" out of
a possible seven points. Forms rated "four" bear only "a
slight resemblance to the blot area; not very plausible, or
based only on one point of resemblance." Creativity was
rated "two" for this response, the score reserved for "ordi-
nary (usual, 'cheap' or banal) responses that are not popu-
lar."

In the tabulation of primary process, Holt gave the
response one-half point for weak Aggressive Content. He
notes that "this only vaguely ominous insect earns (this)
score....because of the single specification 'monstrous'....
Aggression is very remote, hesitantly and implicitly given."

The response is also rated one-half point Formal, for a weak deviation from realistic thinking, implicit in the "misshapen, out-of-proportion grotesqueness."

Due to the remoteness of the response, and the expression of the aggression displaced onto an animal, Control-Defense is given a neutral (non-negative) rating for remoteness. An additional neutral Control-Defense score is given for the potential rather than actual aggression in the percept. In the construction of the Control-Defense pripro variables, the above scores will be reflected in the Control-Defense Total; but not in Control-Defense Plus, since the defenses were not clearly adaptive.

Defense Demand is rated "three", corresponding to a "moderate need for defense", which is expressed in the somewhat unrealistic aggressive content. Holt rated Defense Effectiveness "-.5." Normally, with a Form Level of "four" the DE would be zero, rather than negative. However, the unpleasant affect results in a slightly lower adjustment of this score. As Holt states, "efforts to keep (the aggression) ego-alien are a little too strenuous for us to believe that he has it under good, adaptive control."

DDxDE results in an Adaptive Regression rating of "-1.5" for this particular response. If this person continued to express responses which result in a negative Adaptive Regression average score, he would be in serious psychological trouble. It is comforting to note that the average

Adaptive Regression score for this particular subject was a "safe, but unexciting +2.36."

Measurement of Piagetian Development

Eight Piaget tasks were selected to measure Piagetian Development. They were one-to-one correspondence (Piaget and Inhelder, 1964); conservation of matter (Piaget, 1969); conservation of length (Piaget, 1960); conservation of area (Piaget, 1960); seriation (Piaget, 1960); classification (Piaget and Inhelder, 1964); horizontality of water levels (Voyat, 1975); and moral judgment (Piaget, 1932). The precise protocols for each task except moral judgement, were taken from Voyat (1975). The moral judgement protocol and the scoring criteria were written by myself (Appendix C), after Fritz (1974).

Each task will now be summarized briefly, along with particular scoring criteria which may apply. One-to-one correspondence requires the child to place one horse in front of each cow, after the experimenter arranges a number of cows side by side. Then the cows are extended in space, and later contracted in space, by the experimenter. For each variation, the child is asked whether there is still one horse for each cow, or more horses, or more cows. The child's ability to realize that the same number of cows and horses exist regardless of their spatial positions is examined. For the concrete operational child, conservation has become a

logical necessity. It is explained either by identity or reversibility. Equality is maintained regardless of the perceptual aspects of the configuration. Transitional children will recognize the possibility of conservation, but can be convinced otherwise. Preoperational children are unable to grasp the equivalence of number and are completely influenced by perception.

Conservation of matter requires two balls of clay. After the child arranges them so they both contain "the same amount to eat", the experimenter transforms one ball into the shape of a sausage, and later into the shape of a pie. In each transformation, the child is asked whether there is more to eat in one piece of clay than the other.

The concrete operational child is not misled by the perceptual appearance of the configuration, since conservation of matter is present as a logical necessity. The child demonstrates his understanding of logical invariances by justifying his belief by identity, reversibility or compensation.

Conservation of length minimally requires two sticks of the same length. The experimenter arranges them in a horizontal and parallel position about one inch apart. The child is asked whether they are the same length, and why. If the child does not understand the meaning of "length", the experimenter uses two plastic horses, and asks whether or not each horse would walk the same distance down the pathways. Then

the experimenter performs the transformations, first by moving one stick to the left, and then displaces one stick to the right. For each displacement, the child is asked whether the two sticks are the same length, or is one longer, and why.

The preoperational child loses equality of length as soon as the optical correspondence is broken. The concrete operational child is able to recognize the logical necessity of conservation, by basing his conclusions on the coordination of the parameters involved. He justifies his belief in the logical invariances by one of the logico-mathematical operatory arguments.

Conservation of area requires two equal size green cards, two horses, and thirty-two small houses. The horses are placed in the middle of their respective fields. Each time the experimenter places a house on Field A, he also places one on Field B. After three, five, seven, ten, and fourteen pairs of houses are placed in each field, the child is asked whether the animals have the same to eat, or whether one has more or less. The difficulty is created because in Field A the houses are arranged in rows at one corner; whereas in Field B the houses are dispersed.

Preoperational children do not recognize the equality of area between the two surfaces due to their distraction by perceptual differences of the ordering of equal numbers of objects upon the surfaces. Transitional children will alter-

nately confirm and negate the concept of area conservation. Concrete operational children conserve the area, by mentally reversing the transformations. They justify their beliefs by one of the operatory logico-mathematical arguments.

Horizontality of water levels requires a square plastic bottle, partially filled with green water; a round bottle filled with yellow water, and bags large enough to hold each bottle. A piece of paper with pictures of the bottle in six different positions is given to the child, who is asked to draw the water level for each positioned bottle. However, the child is asked to draw four sets of water levels. The first is anticipatory, in which the actual water-filled bottle is covered. The next set of pictures can be copied from the actual water level, as the experimenter positions the bottle in front of the child. The third set of water levels are drawn by the child after the examiner again covers the bottle, to determine learning. The fourth set of water levels is drawn by the child, anticipating the levels in a covered bottle of different shape.

Preoperational children are not able to draw spontaneously the water levels without seeing them. The base of the bottle is the sole reference point for the water levels, even when copying from the bottle in front of them. Transitional children can draw the water levels by copying them, but cannot anticipate horizontality when the bottle is covered. Concrete operational children can coordinate all the spatial as-

pects of the situation.

Seriation requires ten sticks, graduated in very small steps, from about ten to fifteen centimeters in length. The child is asked to make a staircase out of the sticks, horizontally, from the smallest to the biggest. The child is then asked how he chose the sticks. The preoperational child cannot coordinate the seriation successfully, and fails to consider both the top and bottom of the sticks while arranging them. The transitional child seriates by groping trial and error. The concrete operational child uses a systematic method of seriating the sticks by choosing them in order. The method is operator in that it shows that a given element is simultaneously bigger than the previous one and smaller than the one following.

Class inclusion requires twelve horses and two lions. The child is first asked to name some animals and then name the horses and lions. He is then asked whether there are more horses or animals on the table, and why. Additionally he is questioned whether the horses or lions are a larger group; and whether the subtraction of all the animals from the experimenter will leave him with any left.

The preoperational child cannot grasp the meaning of sub-categories, and is unable to subtract sub-categories from a class. The concrete operational child will be able to perform successfully on all the questions, since he understands the operator rules of the group.

Moral judgment involves the reading of a story to the child, who is then asked questions about it. The story is about a parent who promises that a child can go to camp if the boy himself earns the money. Then the parent asks for the money to go on a fishing trip just before camp starts. The dilemma is between the morality of obedience, versus the morality of reversible rules regardless of the individuals.

The preoperational child will usually decide to give the money to the parent, justifying his answer by immediate physical or psychological consequences. The transitional child will vacillate. The concrete operatory child will justify a refusal of the parent, by identity of situation, and reversibility of characters. A rule of fairness rather than egocentric pleasure or pain will determine the dilemma.

It should be pointed out, although each task contains a list of questions, the focus of Piaget's clinical method is on understanding the quality of the child's answer. Thus, the examiner is expected to probe and challenge the child by offering "contrasuggestions" (Voyat, 1975).

For example, if the child says that the hotdog and ball have the same amount of clay, the examiner might challenge the statement by saying, "Another child said that there was more to eat in the hotdog because it is longer. Do you think you are right or he is right?" By repeating variations on this technique, the questioner can determine whether the response was considered a necessity by the child, or a (tran-

sitional) possibility.

The Piaget protocols are considered as an outline rather than a rigorous, limited procedure. The examiner is relatively free to pursue additional lines of inquiry, to ask additional questions to elucidate the child's stage of development on a particular task. In this sense, the flexibility of the Piaget clinical method differs from standardized test procedures.

Voyat and Mayes (1972) list several distinguishing advantages of the Piaget clinical method: The presentation of task materials allows rapport to develop and motivates the child. The ability to use contrasuggestions and variations allows for the clarification of ambiguous results. Varying the order that questions are asked helps to insure that the child is not repeating them back in the answers. Requiring the child to justify his answers, either verbally or behaviorally, helps to insure that he understands their logical structure, rather than merely mimicking rote responses. The verbatim record insures scoring reliability.

In order to minimize microstructural differences, which were not predictive in Matalon's research, this researcher decided not to use a spread out rating system. Rather, each subject was rated "one" if preoperational, "two" if transitional, and "three" if concrete for each task. The total score was summed and divided by the number of tasks to get a Mean Piaget Score. Additionally, the Mean Piaget Scores were

divided into three categories of Preoperational, Transitional and Concrete Operational groups. The group ranges and number of subjects for each Piaget Score were as follows:

TABLE 2
The Subjects Arranged by Piaget Stage

Mean Piaget Score	Stage	Number of Subjects
1.00 - 1.37	Preoperational	9
1.62 - 2.50	Transitional	18
2.62 - 3.00	Concrete	10

Table 3 describes the eight individual Piaget scores, and the two composite scores of Piaget Development for each research subject.

The utility of the two overall Piaget measures was investigated by creating a correlation matrix within and between tasks, described by Table 3. Although the results will be considered in greater depth during the Discussion (infra), one can note that the high degree of correlation of each task with the Mean Piaget Score and with the Piaget Rank, indicates that both are meaningful composite scores.

The data also indicate that each task is a significant predictor of the composite scores. Correlations of each task with the Mean Piaget Score ranged from .65 to .91, with an average of .77. Correlations with Piaget Rank ranged from

TABLE 3

Correlation Coefficients of Individual
Piaget Tasks and Two Composite Scores

	One to One	Matter	Length	Class	Moral	Horizontality	Seriation	Area	Mean Piaget Score	Piaget Rank
ONE TO ONE	-	84	55	48	68	41	35	60	81	69
MATTER	84	-	63	58	79	45	42	70	89	81
LENGTH	55	63	-	19	60	41	19	40	67	63
CLASS INCLUSION	48	58	19	-	52	41	44	50	65	70
MORAL JUDGMENT	68	79	60	52	-	73	65	64	91	85
HORIZONTALITY	41	45	41	51	73	-	71	57	75	69
SERIATION	35	42	19	44	65	71	-	52	67	63
AREA	60	70	40	50	64	57	52	-	81	67
MEAN PIAGET SCORE	81	89	67	65	91	75	67	81	-	92
PIAGET RANK	69	81	63	70	85	69	63	67	92	-

Decimals omitted

.63 to .85, with an average correlation of .71.

Scoring Reliability

The Holt Primary Process scoring manual has been studied both for repeat reliability and for interjudge reliability. Gray (1967) administered both forms of the Holtzman Inkblot Test to one hundred subjects, with a one-month interval, giving half the subjects one form, the other half the other form at each testing situation (Holt, 1970).

The reliability coefficients for Pripro thinking are .85 on the test-retest, .70 on the parallel form, and .92 on odd-even items. On the last measure, the reliability coefficients for other Holt variables are .88 Formal, .83 Sum Content, .78 Libidinal Content and .78 Aggressive Content.

Phillip, using the Rorschach test, retested ten placebo subjects in a drug study (Holt, 1970), and found the following correlations: Responses .72, Form Level .51, Content Level 1 .58, Formal Level 1 .83, Content Level 2 .80, Formal Level 2 .37.

Most interjudge reliability studies of the major variables achieve excellent results. Rabkin, as reported by Holt (1970), randomly selected 25 Rorschach protocols given to patients in the Menninger Foundation Psychotherapy Research Project. Both he and another Holt trainee scorer obtaining the following reliability coefficients:

Percent Content	.94
-----------------	-----

Percent Formal	.90
Percent Pripro	.92
Form Level	.92
Defense Demand	.86
Defense Effectiveness	.90

It should be noted that these results apply only to the revised ninth edition of the Holt manual, as well as to the tenth edition (1970).

Two trained scorers were used to evaluate the Rorschach test and the Piaget tasks, respectively. The scorers worked independently of one another, and at no time during the scoring did they have access to the complementary set of scores. All identifying information was removed from the data before scoring.

No tests of interjudge reliability were performed. Consistency of inter-subject scoring was insured by using only one rater for the entire Rorschach data, and another rater for all of the Piaget data. By this method, the assumption was made that individual scorer idiosyncracies would be normalized over the subject sample.

The fact that this researcher both administered the Piaget and Holt protocols, and scored the Piaget data was a possible source of design error. It would have been a more rigorous, as well as costly, method had the two groups of protocols been administered by separate individuals, and the data scored by raters who had neither created the hypotheses nor been involved in the testing. One possible error was

that I might have been influenced in the Rorschach administration, after having just administered the Piaget tasks.

Although that possibility exists, it would have been difficult to achieve, since I would have had to estimate successfully both the Mean Piaget Score of the child, and the relative amount of primary process manifestations that would correlate with the particular Piagetian score.

An even more unlikely bias would have occurred in my scoring of individual Piaget protocols, if I had remembered the subject's Rorschach data and had been influenced by it. Such a possibility would have taken an amount of clinical virtuosity beyond the abilities of most clinicians.

CHAPTER THREE

RESULTS

Evaluation of Hypotheses

The eight hypotheses were tested by calculating Pearson product-moment correlation coefficients. Levels of significance were established at .05, using two-tail tests.

Piagetian Development, as measured by either the Mean Piaget Score or Piaget Stage, significantly correlated with seven out of the eight Pripro variables. Only the correlations with the Goldberger score, although positive, failed to achieve significance at the .05 level. A description of the main findings is given in Table 4, and in the following paragraphs:

1. Primary Process Level 2 correlated .38 with the Mean Piaget Score, and .26 with the Piaget Stage. The former correlation is significant at the .05 level. Pripro Level 2 measures both libidinal and aggressive content, as well as deviations from logical thinking. However, the expression of these manifestations of primary process tends to be appropriate, controlled, subtle and civilized, rather than blatant, gross and shocking (Holt, 1970). Holt characterizes Pripro Level 2 expressions as those that would not raise an eyebrow in polite social or professional discussions. The fact that this measure correlates significantly with the Mean Piaget Score implies that as one's logical abilities develop, so

TABLE 4

Correlations between Piagetian Development and Primary Process

Variable	Mean Piaget Score	Piaget Stage
Form Level	.50**	.56***
Defense Effectiveness	.31	.40*
Control-Defense Plus	.36*	.34*
Control-Defense Total	.52***	.56***
Adaptive Regression	.39*	.45**
Primary Process 2	.38*	.26
Content Level 2	.42**	.39*
Goldberger Control	.20	.28*

*Significant at .05
 **Significant at .01
 ***Significant at .001

does the ability to organized primary processes in a controlled, integrated and realistic way.

2. Content Level 2 correlated .42 with the Mean Piaget Score, and .39 with the Piaget Stage. The former correlation is significant at .01, whereas the latter score is significant at .05. Content Level 2 is similar to Pripro Level 2, except that only Level 2 aggressive and libidinal content is measured. The measures of deviations from logical thinking are not included in this score. Content Level 2, then, is a refinement of Pripro Level 2, and it demonstrates that the increase in more integrated and appropriate expressions of primary processes is not due primarily to a decrease in expressions of deviations from logical thinking; but rather to a better integrated, appropriate and controlled expression of libidinal and aggressive wishes. This results indicates that as logical abilities increase, there is a corresponding structural development in the expression of sexual and aggressive wishes.

3. Form Level correlated .50 with the Mean Piaget Score and .56 with Piaget stage. The former correlation is significant at the .01 level, whereas the correlation with Piaget Stage is significant at .001. The Form Level variable, unlike the other Holt measures, is not scored only in conjunction with a Content or Formal manifestation of primary process. That is, every Rorschach response is rated for Form Level regardless of its content.

Therefore, the fact that Form Level increases with Piagetian Development, does not imply a direct relationship between cognitive growth and primary process manifestations. However, the results do support both the Piagetian and psychoanalytic theories of perceptual development (supra, p. 19). Specifically, the results support Piaget's (1969) argument that the concrete operational child is more able to perceive with better integrated and differentiated kinetic images. He sees vivid, anticipatory imagery, which enables him to decenter his attention from static states, and pay attention to operator transformations.

4. Defense Effectiveness correlated .31 with the Mean Piaget Score, and .40 with Piaget Stage. The latter result is significant at .05, and approaches the .01 level of significance. Since Defense Effectiveness is a clinical estimate of the degree to which primary process material is successfully controlled, by taking the form level, affect, and defenses employed into account, the significant correlation with Piaget Stage indicates again that as logical (secondary process) operator structures develop, there is a corresponding increase in effectively controlled expressions of primary process material.

5. Control-Defense Plus correlated .36 with the Mean Piaget Score, and .34 with Piaget Stage. Both results are significant at the .05 level. Control-Defense Plus is a measure of particularly adaptive defense mechanisms used to

defend against primary process material. Although it is a similar measure to Defense Effectiveness, it is more specifically focused on recognized defense mechanisms, and is independent of the form level. It clearly implies that as concrete operations become established, so do adaptive defense measures which control primary processes. The result lends support to the view that defense mechanisms are a cognitively organized subtype of control of libidinal and aggressive wishes (supra, p. 21), and that they are adaptive to the extent that they are integrated with congruent autonomous cognitive structures, rather than remaining developmentally split off.

6. Control-Defense Total correlated .52 with the Mean Piaget Score, and .56 with Piaget Stage. Both results are significant at the .001 level. Control-Defense Total is similar to Control-Defense Plus, except that it counts not only obviously adaptive defense mechanisms, but also neutral or non-negative uses of defenses. Consequently it is a more sensitive measure of the extent to which defense mechanisms are employed as a cognitive style. The highly significant results add further weight to the theory that defenses are a subtype of cognitive control, and that their employment varies with the person's stage of cognitive development.

7. Adaptive Regression correlated .39 with the Mean Piaget Score, and .45 with Piaget Stage. The results are significant at the .05 and .01 levels respectively. Adaptive Regression is Holt's measure of "regression in the service of

the ego", and represents the average adaptability of each Rorschach percept containing primary process material, according to the formula $DD \times DE / PPR$. Although the Adaptive Regression measure is a psychoanalytic one, measuring the relative amounts of id and ego in a behavior, it is also analogous to Piaget's concept of adaptation. From this perspective, the measure expresses the relative amounts of assimilation and accomodation in each Rorschach percept. The fact that Adaptive Regression increases significantly with autonomous cognitive development, lends additional support to the concept of intertwining, hierarchically structured, behavior units of motivation-control, rather than the original Freudian model of separate id and ego systems, and separate primary and secondary processes.

8. Goldberger Score correlated .20 with the Mean Piaget Score, and .28 with Piaget Stage. Neither result was significant at the .05 level, although the latter correlation is significant at .10. It was expected that Piaget Stage would achieve a more meaningful correlation with the Goldberger score than the Mean Piaget Score, since each subject was given only one of four Goldberger ratings.

It is likely that the reason for the rather low correlation between Goldberger and Piagetian Development is that Defense Demand, an important determinant of the Goldberger rank, was virtually unproductive of Piagetian Development. Better results would have been achieved if Sum Pripro had

been used as the measure of primary process material instead of Defense Demand, as Goldberger himself suggested, since Sum Pripro did significantly increase with Piagetian Development.

Additional Findings

A comparison of means derived from the Piaget Stages (Table 5), revealed an increasing trend on all primary process variables tested, from the preoperational, through the transitional to the concrete operational stage. These means were subjected to a one-way analysis of variance. For this purpose the Piaget Stages were treated as if they described independent samples, although in fact the groups were created from the Piaget tasks.

As described in Table 5, Piaget Stages significantly differentiate Form Level; Defense Effectiveness; Control-Defense Plus; Control-Defense Total; Adaptive Regression, and Content Level 2.

It was expected that due to the small number of subjects in each Stage, that individual comparisons between the means would not reach significance levels. This likelihood was given added weight by a Scheffe test which revealed no individual differences between Mean Piaget Scores across Piaget Stages.

Nevertheless, Scheffe tests were performed for comparisons between group means, and no individual comparisons

TABLE 5

Comparison of Means of Pripro Variables
Across Pripro Stages

Variable	Preoper- ational	Transi- tional	Con- crete	F	Proba- bility
Form Level	3.40	4.51	4.81	9.50***	.001
Defense Effectiveness	-.20	.59	1.05	3.43*	.044
Control-Defense Plus	.04	.17	.19	3.11	.058
Control-Defense Total	.20	.52	.64	8.96***	.001
Adaptive Regression	.33	1.31	1.88	4.63*	.017
Primary Process Level 2	.17	.34	.34	1.98	.154
Content Level 2	.19	.32	.37	3.52*	.041
Goldberger Control	1.77	2.67	2.70	2.26	.120

*Significant at .05

**Significant at .01

***Significant at .001

were significant. However, when the preoperational group was compared with the combined mean of the transitional and concrete operational groups, the Scheffe test was significant for all comparisons of the primary process variables.

The implication that the largest difference between groups is that between the preoperational and the others, is consistent with the fact that most subjects in the transitional category had achieved concrete operations in some tasks. According to Piaget's theory, the structural capacities of concrete operations would be present in those subjects, although not manifested in most tasks.

In addition to the hypotheses tested, an exploratory study of additional relationships was conducted between the Piagetian and primary process scores. A description of these additional findings is described in Tables 6 and 7. The additional findings reflect specific types of primary process manifestations that increase with cognitive development. The increase is not only generalized to Content Level 2, but extends to specific types of primary process wishes: Libidinal Content, and Aggressive Content.

Other variables which increase significantly with cognitive development are age, the amount of Rorschach responses, the amount of primary process responses, and the ratio of libidinal to aggressive wishes. It should be noted that, since the sum of Rorschach responses is not linearly related to any variables, the responses obtained cannot be

TABLE 6

Additional Correlations Between Piagetian Development
and Other Variables

Variable	Mean Piaget Score	Piaget Stage
Age	.87***	.77***
Sum Pripro Responses	.37*	.33*
Sum Rorschach Responses	.31	.23
Content Levels 1+2	.40*	.36*
Pripro Levels 1+2	.32*	.32*
Libidinal Content	.41	.39*
Aggressive Content	.37*	.35*
Libidinal-Aggressive Ratio	.45**	.53***

*Significant at .05
 **Significant at .01
 ***Significant at .001

TABLE 7

Additional Comparison of Means of Variables
across Piagetian Stages

Variable	Preoper- tional	Transi- tional	Con- crete	F	Proba- bility
Age	5-5	7-0	8-0	26.44**	.000
Sum Pripro Responses	5.44	11.89	10.2	6.29**	.005
Sum Responses	13.6	23.7	19.1	6.03**	.006
Content Levels 1+2	19.2	33.8	37.3	3.05	.061
Pripro Levels 1+2	32.3	48.9	50.0	2.82	.074
Libidinal Content	5.3	13.4	14.6	4.09*	.026
Aggressive Content	15.0	24.8	31.8	2.36	.109

*Significant at the .05 level

**Significant at the .01 level

attributed to differences in Rorschach productivity with age or stage.

Additional non-significant correlations are described in Table 11 (Appendix D).

An analysis of variance compared the means of boys and girls on all of the Piaget and primary process variables. There were no significant differences (Table 12, Appendix D). However, a comparison of correlational differences between the sexes revealed some minor contradictory results. Boys manifested negative correlations between Defense Effectiveness and measures of primary process content, while girls yielded positive correlations (Table 13, Appendix D). However, boys scored significantly high correlations between Defense Demand and Defense Effectiveness, while girls scored significantly negative on these correlations.

Additionally, the relationship between Creativity and other variables was explored. The results are described in Table 8. They suggest that Creativity correlates positively with Formal deviations in logical thinking, Content Level 1 and Aggression. However, a negative relationship was found between Creativity and Form Level, Defense Effectiveness and Adaptive Regression. These results suggest that the effect of scoring Creativity regardless of its adaptivity or pathology resulted in a score loaded with primary process without effective controls. The more creative a response, the more likely it was to violate logic and to have blatant unsocialized content, particularly of an aggressive

TABLE 8

Correlation Coefficients Between Creativity
and Other Research Variables

Variable	Creativity r
Goldberger Control	-.17
Mean Piaget	.23
Piaget Rank	.23
Form Level	-.30*
Primary Process Responses	.23
Age	.17
Defense Demand	.13
Defense Effectiveness	-.30*
Adaptive Regression	-.24
Content Levels 1+2	.23
Formal Levels 1+2	.33**
Sum Primary Process	.33**
Pripro Level 1	.16
Pripro Level 2	.20
Aggressive	.28*
Libidinal	.13
Content Level 1	.41**
Content Level 2	.19
Formal Level 1	.25
Formal Level 2	.04
Control Defense Total	.10
Control Defense Plus	-.20

*Significant at .10

**Significant at .05

nature. The negative correlation of Creativity and Adaptive Regression highlights the cognitive rather than creative component of the latter score.

A study was performed on the individual Piaget tasks, as to both their contribution to the Mean Piaget Score (Table 3, page 51) and to their specific predictiveness of the primary process variables (Table 14, Appendix D). Differences were found, but they were not extensive. The Mean Piaget Score was a better predictor of primary process variables than seven out of the eight individual Piaget tasks. Class Inclusion, which contributed least to the Mean Piaget Score, was a slightly better predictor of primary process variables, possibly because of its more verbal content, or perhaps because of its explicit logical demands.

Finally, the relative predictability of age and stage was compared (Table 9), using a test of differences in dependent correlations. Piaget Stage was found to be a significantly better predictor than age of Form Level Defense Effectiveness, Control-Defense Plus and Adaptive Regression. Thus, although the correlation between Age and Piaget Stage is .77, the concept of stage has validity as an independent predictor of developmental factors, significantly more predictive than age.

TABLE 9

Comparative Correlations Between Age and Stage
on Pripro Variables

Variable	Piaget Stage	Age	t
Form Level	.56	.38	1.85**
Defense Effectiveness	.40	.26	1.47*
Control-Defense Plus	.34	.17	1.55*
Control-Defense Total	.56	.41	1.20
Adaptive Regression	.45	.27	1.71**
Primary Process Level 2	.26	.41	1.51*
Content Level 2	.39	.38	.09
Goldberger Control	.28	.17	.99

*Significant at .10

**Significant at .05

CHAPTER FOUR

DISCUSSION

The confirmation of the hypotheses of this research is strong evidence for a general cognitive factor which developmentally correlates primary process wishes and controls, with secondary process structures, particularly concrete operations.

As Piagetian Development proceeds from preoperational through transitional, to concrete operational thought, structural reorganization changes primary process ideation in the following ways:

More effectively organized controls and defenses structure libidinal and aggressive wishes, as reflected by increased Defense Effectiveness. Particularly, the child uses more and more adaptive and non-malignant defense mechanisms to establish distance and control over his primary process manifestations. These are reflected in the two defense mechanism scores, Control-Defense Plus and Control-Defense Total.

A further cognitive change is in the increasing use of more subtle, and socialized expressions of primary process wishes which emerge in Level 2 Pripro, especially Content Level 2.

These changes correlate with perceptual development. Perceptual imagery becomes less global, more precise, inte-

grated and articulated, as the Form Level indicates.

The most dramatic expression of the adaptability of the new cognitive structures can be seen by the increase in Adaptive Regression. In this measure, the more primary process demand that is effectively controlled, the higher the score. We have seen that Adaptive Regression increases across Piaget Stages from a preoperational .33, through a transitional 1.31 to a concrete operational 1.88.

Let us more closely examine the Adaptive Regression score to determine the impact of its various components. Defense Demand, one of the two multiples in the score, correlates with the Mean Piaget Score at .03, and with Piaget Stage at .06. Furthermore, Defense Demand changes little with Piaget Stage, from an average of 2.22 in the preoperational group; through a transitional mean of 2.19, to a concrete operational level of 2.35. Moreover, Defense Demand correlates $-.18$ with Adaptive Regression. One can surmise from this analysis that a major factor in the increase of Adaptive Regression is the controlling one of Defense Effectiveness.

This hypothesis is substantiated upon examination of the third variable in the equation, the divisor Primary Process Responses. As seen from Tables 6 and 7, the number of Primary Process Responses on Rorschach protocols correlates significantly with Piagetian Stage, with an increase especially between the preoperational and transitional stages. Therefore, in order to have an increase in the total Adaptive

Regression score, it is necessary for Defense Effectiveness to be the principle bearer of the change. Not only does it have to deal with a constant Defense Demand; but also it has to more than reciprocally compensate for the increasing divisor "PPR."

It is no surprise that in contrast to the negative correlation between Defense Demand and Adaptive Regression, Defense Effectiveness correlates with the score at .64, and the number of Primary Process Responses correlates at .27.

It is strikingly clear, then, that the cognitive aspect of Adaptive Regression is the main determinant in the developmental increase in the score.

The findings of significant increases in Level 2 Pripro and Content are consistent with Holt's (1966) study of two primary process factor analyses. In both analyses, one factor, accounting for 7.3 per cent and 14.5 per cent of the variance, respectively, is loaded mainly with measures of intellectual ability. This factor includes both high W.A.I.S. scores and Pripro Level 2. Holt concluded that "the ability to produce civilized or socially acceptable manifestations of the primary process characterizes persons of superior cognitive competence (1966, p. 21)." The present study lends a genetic component to this interpretation. As cognitive competence increases, so does the ability to express one's libidinal and aggressive wishes in a socialized and civilized manner.

The findings of this study, while they are supported

by ego psychological and Piagetian theory, clash with the results of the Matalon (1974) and Rabie-Dudek (1975) experiments. Dudek had concluded, as a result of these studies, that

The results of these two studies tell us that presence of primary process in (projective tests) seemingly contributes little to the intellectual, perceptual-motor, scholastic, or personality development of young children. The few negative correlations with intelligence and reading comprehension may just as easily be chance findings. It would seem as if primary process thinking, to the extent that it manifests itself in projective material, is a reasonably normal development with little evidence of specific negative or positive contribution to the child's functioning at ages six and seven.... In sum, it is not at all clear what function easy access to primary process thinking in young children may serve... It does not seem to be put to adaptive use for purposes of scholastic or other kinds of achievement (Dudek, 1975, pp. 372, 375).

One difference between the Dudek research and this study is that Dudek limited herself to the scoring of drive content. Both Formal thought deviations, as well as additional structural measures such as Defense Effectiveness, Form Level, and Control-Defense scores were not included in the study. Another reason for the difference in results has been offered, in terms of the restricted age span of the Dudek-Rabie and Matalon subjects, which inhibited the emergence of macro-structural differences, both in Piagetian tasks and in primary processes.

The conflict between Dudek and Matalon approach, and this one might lead to criticism of the present study on the grounds that other developmental factors associated with

age produced the cognitive and Pripro changes. The concept of age is somewhat spurious, in that no people are the same age unless born at the precise second. There is nothing sacred about keeping all children tested within a year of each other's chronological age. Yet such factors as educational reinforcement and biological change might conceivably affect the results.

The conflict between reinforcement theory and stage theory has been resounding for many years, and will not be reviewed here. We will limit ourselves to Elkind and Flavell's (1969) observation that most successful reinforcement experiments which teach a conservation task are performed on subjects who have already achieved conservation in another related task. The implication is that the necessary cognitive developments have prepared the stage for successful learning to occur.

Maturational changes definitely occur which may significantly account for cognitive development. For instance, complete myelinization of the tracts from the cortex to the thalamus does not occur until the age of eight (Kaplan, 1965). Likewise, alpha patterns, as measured by the E.E.G., do not stabilize until the same age. Yet, as Freud observed years ago, complex mental behavior, while clearly having physiological bases, manifests itself in ways that can best be described by psychological concepts, with the limited state of our knowledge.

By giving credence to maturational changes which conceivably underlie aspects of structural development, we do not minimize the crucial fact that stage rather than age is a better predictor of the significant primary process developments in the present study. Table 9 demonstrates that Piaget Stage is a significantly better predictor than age for four out of the eight primary process variables in the hypotheses. Although age correlates very highly with stage in this research, at .77, by no means does it replace it.

The hypothesis that cognitive development occurs in conjunction with primary process changes had been postulated originally by Freud, but in economic terms. In The ego and the id (1923), he stated that "(the ego) withdraws libido from the id and transforms the object cathexes of the id into ego-structures (p. 235)." In 1924, Freud postulated specifically the gradual integration of primary defense mechanisms into mature ego structures. Again, he saw this occurring at the expense of primary libidinal energy, which he thought would decrease during the latency years:

It is during this period of total or only partial latency that are built up the mental forces which are later to impede the course of the sexual instincts and like dams, restrict its flow--disgust, feelings of shame and the claims of aesthetic and moral idealsno doubt education has much to do with it.... The restraining forces probably emerge at the cost of the infantile sexual impulses themselves. Thus the activity of those impulses does not cease even during this period of latency, though their energy is devirted, either wholly or in great part, from their sexual use and directed to other ends (1905, p. 56).

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Such hypotheses were contradicted by the results of this study, as well as by others.

Safrin found that total primary process percentages remained constant with age, while Content increased and Formal decreased. Matalon, and Holt (1970) obtained equivalent Sum Pripro levels (Table 18, Appendix D). My results showed a significant increase in total primary process with development. Content significantly increased, while Formal errors increased slightly, from the ages of five to eight years.

Furthermore, the increase in Level 2 Pripro and Content, do not coincide with a decrease in Level 1 Pripro. Rather, my data show that the mean Level 1 scores increase from a preoperational mean of 18.6 per cent, through a transitional 19.4, to a concrete operational 25.2.

Another possible justification for Freud's hypothesis of a reciprocal relationship between primary process and ego structure could be found conceivably in the type of Content which increases. Hartmann (1964) postulated that defense mechanisms are created out of amounts of neutralized aggressive energy. A comparison of Aggressive and Libidinal Content scores reveal no significant differences as they both increase with age (Tables 6 and 7). However, the Libidinal/Aggressive ratio score does significantly increase with development (Table 7) and coincides with Safrin's (1974) results. It is difficult to weigh this evidence in relation to Freud or Hartmann's theories. Increases in Libidinal, Aggressive Content

as well as in Control-Defense measures may more likely be caused by a total increase in energy, rather than by an energy displacement.

Overall, the increase in primary process during the latency years, reflected in every variable considered, tends to refute Freud's (1923) hydraulic model of psychic energy. Freud still might have offered the defense that Rorschach manifestations are verbal and controlled forms of primary process; whereas ludic and motoric expressions of primary process do decrease proportionately. Such non-provable contentions, which prevent effective experimental testing of metapsychological assumptions, are one reason why Holt (1974) and others have abandoned Freud's economic model.

Although Freud's economic model of structural development is contradicted by the data, his point that latency marks a period of increasing relative control over libidinal wishes is clearly supported. If we approximate early and middle latency by the average ages of the transitional and concrete operational groups, 6.95 and 8.10 respectively, this research could be used as a proof of Freud's argument. However, a study specifically designed to measure controls over Pripro during latency would incorporate additional developmental criteria to define this stage (Safrin, 1974).

The utility of Adaptive Regression as a measure of cognitive control over wishes, does not imply that it is necessarily related to creativity (supra, p. 29). It may

be recalled that Silverman (1963), Rogolsky (1968) and Newmeyer (1972) had studied the latter possibility with mixed degrees of success. The present research also included the Holt measure of Creativity. This was designed as an independent rating by the Rorschach scorer, of the originality of each response regardless of pathology.

No positive relationship was found between Creativity and Adaptive Regression. In fact, a negative relationship emerged between the two measures (Table 8). The correlation between Creativity and Adaptive Regression was $-.23$. This trend was highlighted by correlations of $-.30$ with both Defense Effectiveness and Form Level. The latter correlations are significant at $.10$.

In order to understand these results more fully, the relationship between Creativity and other Pripro variables is presented in Table 8 (supra, p. 67). As Creativity increases, so does Sum Pripro, Sum Formal, Content Level 1 and Aggressive Content. Silverman (1963) achieved similar results in a post hoc analysis. We can surmise from this that the more creative a response, the more likely it is both to violate logic and to have blatant unsocialized content, particularly of an aggressive nature.

The effect of scoring Creativity regardless of its adaptivity or pathology resulted in a score loaded with primary process without effective controls. Such a result would not be likely to characterize the artist, who presumably has

access to primary process material, and control over it.

Considering the divergent results between Creativity and Adaptive Regression in the present study, it is difficult to account for the opposite results in the Newmeyer research. Although the populations differed in racial characteristics, it seems more meaningful to hypothesize that the two creativity scores were based upon different criteria. Presumably Newmeyer's scoring emphasized richness rather than statistical originality.

Dudek (1974) recently studied the relationship between creativity, measured by Torrence Test A, and Holt Content scores among ten-year-old children, artists, psychiatrists and college students. She found significant relationships in all groups except for the children. Additionally, there were no correlations of creativity with Adaptive Regression, Defense Demand, or Defense Effectiveness among the children. She concluded that,

Children are not necessarily creative. They are expressive. It would seem logical to conclude that the young child is not regressing in the service of the ego. He has not yet needed to, or learned to, transform sources of free energy into sublimated or creative products (Dudek, 1975, p. 376).

Without repeating at length the methodological differences between the Dudek and Matalon studies, and my own regarding sample selection and age, I will emphasize that the Adaptive Regression hypothesis was strongly supported in the present study and closely intercorrelated with measures of structural development. Her conclusions regarding creativity, moreover,

need to be separated from those regarding adaptive regression.

I would agree with Dudek that the results of creativity studies with children are "ambiguous." One aspect that needs to be investigated at greater length is the meaning of "creativity" in children. The criteria at this point are implicit and blurred, the operational definitions imprecise, and the results confusing. Developmental study would again be useful in highlighting changes and relationships.

The comparison of boys and girls across all of the major variables in this study resulted in no significant differences between them. The boys tended to have a slightly higher percentage of Aggressive content, whereas the girls tended to have slightly higher levels of Libidinal Content. These differences were significant at the .11 and .23 levels, respectively. A ratio was created out of the Libidinal and Aggressive per cent scores: Libidinal/Aggressive per cent ratio. Girls are higher than boys on this ratio, at a significance level of .08. These results are consistent with popular stereotypes of differences between boys and girls.

The data presented do not coincide with Matalon's suggestion that boys manifest greater amounts of primary process than girls, whether effectively or poorly defended. An additional attempt to discover differences among correlations between boys and girls revealed contradictory differences. Most notable was a cluster of significant differences between boys and girls in the relationship between primary process

contents and adaptive regression (Table 13, Appendix D). Boys showed significant negative correlations, whereas girls manifested significantly positive correlations. The same trend extended to correlations between Content and Defense Effectiveness. These results, we must remember, are separate from the analysis of variance on individual variables, which revealed no differences between boys and girls on either Defense Effectiveness or Adaptive Regression.

One would anticipate from this that the same trend would be present in the relationship of Defense Demand with Defense Effectiveness, with girls having higher correlations than boys. Surprisingly, however, the correlation for girls is $-.55$, and the correlation for boys is $.66$, both of which are highly significant. The opposite sets of results cannot be explained by differences in Formal per cent, of which there are none. Nor can they be explained by differences in Adaptive Regression.

The meaning of these results is unclear, with contradictory trends. It may be that the large number of correlated comparisons, nine hundred, resulted in chance differences in this area. Further research and clarification is necessary to unravel possible sex differences in styles of content and defense organization.

We turn now to a reconsideration of the relationship between individual Piaget tasks and the remaining data. In the chapter on method (*supra*, p. 34), the individual tasks

were shown to be predictive of both the Mean Piaget Score and Piaget Rank (Table 3). Yet individual differences do exist between the tasks (Table 15). Both Moral Judgment and Conservation of Matter show significantly higher correlations with the Mean Piaget Score than do Class Inclusion, Seriation, Length Conservation and Horizontality. The lowest predictor of the Mean Piaget Score is Class Inclusion, which manifests a significantly lower correlation than One-to-One Correspondence, Conservation of Matter, Conservation of Area or Moral Judgment.

The high predictability of the Moral Judgment task can be partially explained by experimental bias. All Piaget tasks were given in the same order, with Moral Judgment fourth out of eight. This task, designed by myself, was the most difficult to score because the answers were the most verbal and ambiguous. Children seemed to feel uncomfortable giving reasons for resolving the dilemma between reversibility and authority, and often times they refused to respond adequately to make an informed judgment about their stage level.

Consequently, I believe that I was sometimes influenced by other Piaget tasks in evaluating the results on moral judgment. The tendency to score preoperational on this task if the child performed similarly on other tasks, might account for its high predictability of the composite scores.

Another difficulty in administration might have accounted for the low predictability of Conservation of Length.

The task instructions recommend that if children do not understand the definition "length", then the examiner should explain the situation by using two small horses which go along separate stick "roads". This examiner found, however, that often children who were successful at the task without horses, were unsuccessful when the horses were used. It seems that the question of whether one horse walks further is more difficult than the question of whether one stick is longer. Consequently, the results might have been distorted depending upon which way the questioning proceeded.

Of the remaining tasks, the two lowest predictors of the Mean Piaget Score were Seriation and Classification. Both of these tasks are among the Piaget grouping of elementary logic. They contrast somewhat with the remaining tasks which are based upon the principle of conservation whether it be of matter, area or number. The difference between the two types of tasks might explain the discrepancies in predicting the Mean Piaget Score.

When we compare the individual Piaget tasks with the composite scores as predictors of Pripro correlations (Table 15, Appendix D), we find, to our satisfaction, that both the Mean Piaget Score and Piaget Rank achieve higher correlations, on the average, than every individual task except Class Inclusion (Table 16, Appendix D). The latter task correlates higher with primary processes on seven out of eight variables; however, only the correlation with Goldberger score is significantly higher.

Table 17 (Appendix D) demonstrates that Conservation of Length achieves the lowest correlations with the primary process variables. Yet, when tested for significant differences, the Mean Piaget Score proves to be higher only with the Control-Defense correlation. From these comparisons between the best and worst individual task predictors of correlations with the Pripro scores, the strength of the composite Piaget scores is further enhanced as overall indicators of Piagetian Development.

Class Inclusion emerges as the worst predictor of the Mean Piaget Score; yet the best predictor of Pripro correlations. The task is the most precise in its reflection of the logico-mathematical laws of the Galois group (supra, p. 9) than any of the others. It is the only one of the tasks involving rigorous deductive logic. We have mentioned that one reason for Class Inclusion's lower predictability of the Mean Piaget Score than the other tasks may be due to the fact that the others stress conservation more than deductive logic. The higher predictability of class inclusion with the Pripro variables, may be further proof that structural organization is a more important factor than perceptual style in understanding the correlations between Rorschach and Piaget manifestations of thought processes.

Another way to consider the class inclusion results is through the fact that this is one of the more verbal tasks. One might argue that language is the link between the higher predictability of the Rorschach and Class Inclusion scores.

However, the fact that the most verbal of the tasks, Moral Judgment, does not follow this pattern cuts against this interpretation.

The use of the Holt Primary Process Manual with children raises questions about the developing nature of primary process manifestations. The present study demonstrates the utility of Adaptive Regression measures, defense ratings, and Pripro levels to reflect the increasing cognitive structure of primary process wishes. However, one theoretical basis of Holt's manual is the presumably strong relationship between Pripro Content and Formal measures. Holt (1970) presented empirical evidence from adults to justify this conception of primary process. Yet, in previous studies with children, content tended to increase with age, while formal measures would decrease. In the present study, while there was no decrease in Formal per cent, there was no correlation between any manifestations of Formal and Content.

It must be concluded that the correlation of Pripro Content and Formal is true only for adults and does not have a basis in developmental research, although each measure is independently useful in understanding the development and style of thinking processes. The emergence of illogical Content amongst disturbed adults cannot be equated with the thinking styles of young children. A child's logic would fluctuate much less with his wishes than with cognitive development, and his wishes would increase with the growing ability to con-

trol and express them.

From a developmental viewpoint, the continuum model of hierarchically structured wishes on a pole from blatant to civilized makes more sense; and it is in the measures of Defense Effectiveness, Level 2, and Adaptive Regression that this shift from primary to more secondary processes is best reflected.

Consequently, when we compare Pripro data between different age groups (Table 18, Appendix D), even accounting for significant differences in scoring style, the relatively constant amount of Sum Pripro across studies is a meaningless statistic if one accepts the developmental reciprocity of Content and Formal, and the adult constancy of those variables.

More meaningful is the increasing age trend across studies of Level 2 Content and Pripro, of Sum Content and of Form Level. Together these measures support the hypothesis of developmental increases both in the expression and control of aggressive and libidinal wishes.

The theoretical model of motivational-cognitive structure which has been developed by the ego psychologists and been given empirical support in this research, nevertheless criticizes one aspect of Freud's (1923) theory which he tried to correct when he switched from the topographic to the structural model of the mind. Freud had partially abandoned the former model because the separation of the Unconscious

from the Preconscious failed to separate motivational and inhibitional functions, both of which could be conscious or more usually unconscious.

However, the distinction between ego and id also fails to separate wish and control, since both structure and motive are organized into intertwining hierarchical patterns. Consequently, Freud's notions of id and ego need to be redefined along the lines suggested, to allow each macrostructure to include both "drive" and "control" microstructural units.

As we have mentioned, the integration of wish and control forms the basis for Piaget's model of adaptation too, in which every behavior involves assimilation, of the environmental demands to the needs or wishes of the organism; and accomodation of those needs and wishes to the requirements of reality. From this point of view, the Content and Defense Demand of each Rorschach percept represents assimilative behavior. Likewise, the wish is organized, more or less successfully, by the realistic requirements of the inkblot. This accomodation is reflected in the scores of Form Level, the positive Defense mechanism scores, and Defense Effectiveness. The relative amount of assimilation and accomodation in each percept expresses the level of Piagetian adaptation as well as Adaptive Regression.

The crucial role of the adaptive content becomes apparent both from the revised psychoanalytic model and the Piagetian model of thought. For either, Adaptive Regression

represents the average adaptability of each behavior, including each Rorschach perception. This is true whether the behavioral components are called Defense Demand - Defense Effectiveness; content-structure; assimilation-accomodation; drive-defense; id-ego; motivation-control; or cathexis-counter-cathexis.

Before concluding, I would like to suggest several areas for possible additional research. First, the study might be extended to Piaget's formal operations, with the expectation that as that stage develops, so will Pripro Level 2, the various measures of control and defense, and Adaptive Regression. A possible control over instinctual drive would be to score separately for pre and post menarche or pubescent subjects, in an effort to determine the relative strength of sexual changes on psychological structure.

A more ambitious project would be to recast the Holt manual in Piagetian terms, with Content and Defense Demand corresponding to assimilation measures; Defense Effectiveness and Form Level corresponding to accomodation measures; and Adaptive Regression corresponding to Adaptivity. Various measures of verbal deviations from logical thinking could be considered from a Piagetian rather than Freudian perspective.

A third area of research would be to control for the extent to which language mediates the relationship between measures of Freudian and Piagetian thought. One might iamgine applying the Holt manual to measures of play in a structured

playroom, to get a nonverbal measure of primary process.

Freud expressed his hope in the triumph of the reality principle with increasing maturity. Piaget expected that the preoperational instability of assimilation over accommodation would tend towards a more balanced equilibrium as the child enters the world of concrete operations. This research has helped to show that as the child moves from preoperational to concrete thought and from primary to secondary processes, his new logico-mathematical organizations correlate significantly with increased adaptive control over his libidinal and aggressive wishes.

CHAPTER FIVE

SUMMARY

This study attempted to compare the development of thought in five to eight-year-old children, from the perspective of two developmental models. The first, postulated by Piaget, describes cognitive development through a succession of stages: Preoperational, transitional and concrete operations. Each stage is a structure described by particular logico-mathematical laws, which increase in complexity and adaptivity as the child grows.

Freud likewise postulated a developmental sequence, from primary process to secondary process thinking. As development occurs, the child's thought becomes less wish-dominated, pleasure-demanding and mobile; and more inhibited, reality-oriented and logical.

The basic premise of the study was that underlying structures would result in correlations between measures of Piaget and Freudian thought levels.

The sample consisted of thirty-seven white, middle-class children, all of whom had at least one college educated parent. The subjects ranged in age from five years to eight years eleven months.

Each subject was individually tested on two sets of protocols. The first set consisted of eight of Voyat's Piaget tasks, each of which measured the child's task-specific stage of intellectual development. The second protocol was

a Rorschach test, which was administered according to Holt's procedures, and scored by an independent clinician.

Each child's level of Piagetian Development was estimated by two constructed measures. The Mean Piaget Score was the average of the combined task scores. The children were divided into one of three groups of Piaget Stage, on the basis of their Mean Piaget Scores.

Two measures were constructed from the Holt manual which measured the percentages of defense mechanisms in each Rorschach protocol. They were Control-Defense Plus, which consisted of adaptive defense mechanisms; and Control Defense Total, which consisted of non-maladaptive defenses.

Eight hypotheses were tested. They stated that Piaget Development is positively correlated with (1) Form Level; (2) Defense Effectiveness; (3) Adaptive Regression; (4) Goldberger Score; (5) Control-Defense Plus; (6) Control-Defense Total; (7) Pripro Level 2; and (8) Content Level 2.

All of the hypotheses were confirmed with significant correlations on one of the two measures of Piaget Development, except for the Goldberger hypothesis which was positive but not significant. The level of significance was established at .05, using a two-tail test.

Additional analyses resulted in other significant findings. An analysis of variance, treating the Piaget Stages as independent groups, yielded significant differences on

measures of Form Level, Defense Effectiveness, Control-Defense Plus, Control-Defense Total and Adaptive Regression. All of these scores increased across each Piaget Stage.

Scheffe tests comparing individual scores between Piaget Stages, revealed no significant differences between individual stages; but Scheffe tests significantly differentiated preoperational scores from the combined transitional and concrete groups on all primary process variables. The necessity of combining groups to score significant differences was attributed to low group sample size.

An analysis of variance compared the means of boys and girls on all of the Piaget and Holt variables. There were no significant differences. However, a comparison of correlational differences between the sexes revealed some minor contradictory results.

Correlations were performed among the eight individual Piaget tasks, and the two constructed composite scores of Piagetian Development. The correlations of the eight tasks with Piaget Stage and Mean Piaget Score ranged from .65 to .91, with each task contributing significantly. However, Moral Judgment, Conservation of Matter and Conservation of Area contributed more to the composite scores than did horizontality, Seriation, and Class Inclusion.

A further correlational analysis compared individual Piaget tasks with the composite Piaget Development scores, as predictors of Pripro variables. Only Class Inclusion

emerged as a slightly better predictor than the composite scores. Conservation of Length manifested lower predictability than the composite scores.

A final investigation revealed some additional correlations with Piagetian Development. They included age; Sum Content; Libidinal Content; Aggressive Content; Libidinal/Aggressive Ratio; and the Sums of both Rorschach and Pripro responses.

The findings were regarded as evidence of underlying cognitive structures which result in correlations between Piagetian and Freudian tasks. As Piagetian Development results in the internalization of concrete operatory mechanisms of a secondary process nature, primary process libidinal and aggressive wishes become more subtle and socialized, and they are expressed through more adaptive controls and defense mechanisms.

It was argued that the increase in Adaptive Regression across Piaget Stages, supports both a Piagetian and a revised psychoanalytic model of behavioral adaptivity, in which motivational-cognitive units of structured wishes, representing relative balances of assimilation-accomodation and primary process - secondary process, are organized hierarchically along a continuum from unsocialized primary processes to highly organized and socialized secondary processes.

The negative findings of other researchers were differentiated from this study by the narrower age ranges of

their samples, which inhibited manifestations of macro-structural differences in cognitive development.

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APPENDIX A

LIST OF ABBREVIATIONS OF PIAGET AND HOLT VARIABLES

Piaget

One to one:	One-to-one correspondence tasks
Matter:	Conservation of matter
Length:	Conservation of length
Class:	Class inclusion
Moral:	Moral judgment task
Horizon:	Horizontality of water levels task
Area:	Conservation of area task
Mean Piaget Score:	Sum of eight Piaget task scores, divided by eight
Piaget Stage:	One of three groups of Mean Piaget Scores. Either preoperational, transitional, or concrete.
Piaget Development:	A composite measure, combining the scores on individual Piaget tasks. Either Mean Piaget Score, Piaget Stage, or both.

Holt

DD	Defense Demand. The "shock value" of a response.
DE	Defense Effectiveness. The extent to which pripro is controlled.
DDxDE/PPR	Adaptive Regression
FL	Form Level. Scored for every response, and averaged.
Pripro	Primary process. Includes Content and Formal scores.

Sum Pripro	The total per cent of primary process scores. Also called Pripro Levels 1+2.
Content	The per cent of primary process libidinal and aggressive wishes.
Formal	The per cent of primary process logical thinking deviations: condensation, etc.
Level 1	Per cent of unsocialized, blatant primary process
Level 2	Percent of civilized, acceptable primary process
Control-Defense Plus	The per cent of positive Control-Defense mechanism scores
Control-Defense Total	The per cent of positive and non-negative Control-Defense mechanism scores
Goldberger	Goldberger's four-group ranking of primary process control: mature, rigid, but good controls, rigid with breakthroughs, poorly controlled. A measure of adaptive regression
Aggressive	The per cent of aggressive content
Libidinal	The per cent of libidinal content
Aggressive/libidinal Ratio	The per cent of Aggressive, divided by the per cent of Libidinal
Adaptive Regression	$DD \times DE / PPR$
PPR	The number of primary process scores
Creativity	An independent rating of each response for originality, whether pathological or adaptive

APPENDIX B

THE CITY COLLEGE
of
THE CITY UNIVERSITY OF NEW YORK
New York, N.Y. 10031

THE PSYCHOLOGICAL CENTER
DEPARTMENT OF PSYCHOLOGY

Dear Parent,

As a Ph.D. candidate at City College (C.C.N.Y.), I am currently writing a thesis on intellectual development in children, concentrating on six, seven, and eight-year-olds.

For my study, I work with children for an hour or two each, using Jean Piaget's tests and puzzles, as well as projective tests, to explore a child's level in dealing with concepts involving logic and number, creativity, as well as the understanding of spatial relationships. These concepts underly many learning tasks, and hopefully my work will be of benefit to a better understanding of child development for teachers and parents.

My thesis is being supervised by Dr. Gilbert Voyat, at City College, an expert in intellectual development in children.

As you might guess, I have to find children to work with on my own. A few children are referred by teachers whom I know. Others are related to friends of my family. A goodly number of children, however, volunteer when I explain to them some of the puzzles, which they find intrinsically interesting. Where appropriate, and if the parent agrees, I offer the child a small wage, such as 25¢ an hour, for his work in a scientific study.

I work with the children in a quiet place, either at my office at City College, my home at 300 Riverside Drive (at 102d St.), or a quiet room in the child's home. I am happy to explain the tasks and puzzles to parents, and to give them feedback on their child's intelligence level.

If you consent to allow your child to participate in this study, please sign below. (All names are kept confidential and removed from the child's answers during the scoring of results.)

Sincerely,

James Wulach, M.A.
City College of New York
Lecturer

Parent Consent:

1. I consent to allow my child to participate in your dissertation on intellectual development in children.

Signature of parent

date

2. My child, _____ (name), is _____ years old, and was born _____ .
month day year

3. My address is _____ .

4. My telephone number is _____ .

5. I would like to discuss the results with you, on the Piaget tasks (yes no).

6. I would like you to work with my child (day evening)
 - a. at my home
 - b. at your home
 - c. at your office
 - d. wherever you want

7. Additional comments:

APPENDIX C

MORAL JUDGMENT TASK

Part I: Presentation of story

Joe (Mary) is a seven-year-old boy (girl) who wanted to go to summer camp very much. His father promised him he could go if he saved up the money for it himself. So Joe worked hard at his newspaper route, delivering papers and saved the forty dollars it cost to go to camp and a little more besides. But just before camp was going to start, his father changed his mind. Some friends of his father decided to go on a special fishing trip, and Joe's father was short of the money it would cost. So he told Joe to give him the money he had saved from the paper route. Joe did not want to give up going to camp, so he thought of telling his father "no".

Part II: Questions

1. Should Joe refuse to give his father the money? Why?
2. Should a child ever disobey his parents? Why?
3. Should a father keep a promise to his child always?
4. Is it ever O.K. to break a promise? When?
5. If the man was not Joe's father but just a friend, would Joe do something different? Why?
6. Why should promises be kept?

MORAL JUDGMENT CRITERIA

Stage 1: Preoperational

The child justifies his answers by the standard of subjective physical or psychological consequences. He will usually take the position that the child should give the money to the more powerful father, because otherwise he will be punished or disapproved of. He is unable to decenter from the egocentric point of view towards a set of rules which would govern the situational dilemma.

Stage 2: Transitional

The child vacillates between focusing on the consequences of disobeying the father, and focusing on the implicit contract of the father's promise. He can be convinced to focus on either point of view, but cannot coordinate them into a logical system of justification.

Stage 3: Concrete

The child has succeeded in decentering himself from subjective immediate consequences, and is able to apply the operations of identity and reversibility to the moral dilemma. He justifies his answers by arguing that the promise is "fair" and binds both parties to its conditions. He may also justify the refusal of the child to return the money by role reversal, such that the father would expect his child's promise to be kept. He implicitly realizes that the promise is a reciprocal operation which governs both parties regardless of subjective, egocentric desires.

APPENDIX D

ADDITIONAL TABLES

- TABLE 10. Subject Performance in Individual Piaget Tasks and Combined Scores
11. Additional Non-Significant Correlations Between Piagetian Development and Pripro Variables
 12. Comparison of Means of Boys and Girls across Research Variables
 13. Differences in Correlational Trends Between Boys and Girls
 14. Differences in Correlational Strength of Individual Piaget Scores
 15. Correlations Between Piaget Tasks and Primary Process Variables
 16. Differences in Correlational Strength between Mean Piaget Score and Class Inclusion across Primary Process Variables
 17. Differences in Correlational Strength between Mean Piaget Scores and Length across Pripro Variables
 18. Comparison of Means between Holt, Matalon, Safrin, and Wulach Primary Process

TABLE 10

Subject Performance on Individual Piaget Tasks
and Combined Scores

Subject	One to One	Matter	Length	Class Inclusion	Moral Judgment	Horizontal-ity	Seriation	Area	Mean Piaget Score	Piaget Rank
40	1	1	1	1	1	1	1	1	1.00	1
39	1	1	1	1	1	1	1	1	1.00	1
34	1	1	1	2	1	1	1	1	1.12	1
38	1	1	1	2	1	1	1	1	1.12	1
42	3	1	1	1	1	1	1	1	1.25	1
21	1	1	1	2	1	1	1	2	1.25	1
41	1	1	1	2	1	1	2	1	1.25	1
36	2	1	3	1	1	1	1	1	1.37	1
37	2	1	1	1	2	1	1	1	1.37	1
35	2	2	1	3	2	1	1	1	1.62	2
33	3	2	1	3	1	1	1	1	1.62	2
23	1	1	3	2	2	2	2	1	1.75	2
32	3	2	3	3	2	1	1	1	1.87	2
22	3	3	3	2	2	1	2	1	2.12	2
16	3	3	3	2	2	1	1	2	2.12	2
18	3	3	3	2	2	1	1	2	2.12	2
19	3	3	3	2	3	2	1	1	2.25	2
10	3	3	3	2	2	1	1	3	2.25	2

Transitional

Preoperational

Table 10 (cont.)

<u>Subject</u>	One to One	Matter	Length	Class Inclusion	Moral Judgment	Horizontal-ity	Seriation	Area	Mean Piaget Score	Piaget Rank
14	3	3	3	2	2	1	1	3	2.25	2
26	3	3	1	3	2	1	2	3	2.25	2
28	3	3	3	3	2	1	1	3	2.37	2
09	3	2	3	2	2	3	2	3	2.50	2
20	3	2	3	2	2	3	2	3	2.50	2
11	3	3	2	2	3	2	3	2	2.50	2
17	3	3	3	2	3	2	1	3	2.50	2
04	3	3	3	2	3	2	2	2	2.50	2
15	3	2	1	3	3	2	3	3	2.50	2
13	3	3	3	3	3	2	2	2	2.62	3
03	3	3	3	3	3	2	2	3	2.75	3
01	3	3	3	2	3	2	3	3	2.75	3
25	3	3	3	2	3	2	2	3	2.62	3
27	3	3	3	3	3	2	2	2	2.62	3
29	3	3	3	3	3	2	2	3	2.75	3
08	3	3	3	3	3	2	3	3	2.88	3
31	3	3	2	3	3	3	3	3	2.88	3
02	3	3	3	3	3	3	2	3	2.88	3
30	3	3	3	3	3	3	3	3	3.00	3

Con-
crete

TABLE 11

Additional Non-Significant Correlations between
Piagetian Development and Pripro Variables

Variable	Mean Piaget Score	Piaget Stage
Creativity	.23	.23
Defense Demand	.00	.09
Formal Levels 1+2	.22	.27
Pripro Level 1	-.02	.12
Content Level 1	.08	-.01
Formal Level 1	.07	.04
Formal Level 2	.01	.10

TABLE 12

Comparison of Means of Boys and Girls
Across Research Variables

Variable	Boys	Girls	F	Probability
Creativity	2.00	1.99	.01	.925
Goldberger Control	2.33	2.54	.30	.587
Mean Piaget Score	2.22	2.03	.83	.367
Piaget Rank	2.13	1.95	.53	.470
Sum Pripro Responses	9.46	10.13	.15	.699
Form Level	4.25	4.37	.16	.687
Age	86.4	80.1	1.64	.209
Defense Demand	2.23	2.24	.00	.963
Defense Effectiveness	.58	.53	1.83	.184
Adaptive Regression	1.29	1.18	.06	.801
Responses	18.8	20.8	.51	.480
Content Levels 1+2	34	28	.88	.354
Formal Levels 1+2	21	24	.27	.607
Pripro Levels 1+2	45	44	.01	.926
Pripro Level 1	23	19	.32	.576
Pripro Level 2	28	31	.21	.650
Control-Defense Total	52	44	.72	.400
Control-Defense Plus	13	15	.16	.689
Libidinal	9	13	1.49	.230
Aggressive	29	20	2.65	.113
Content 1 %	26	31	.95	.336
Content 2 %	33	29	.53	.471
Formal Level 1	7	8	.11	.737
Formal Level 2	19	20	.07	.791

TABLE 13

Differences in Correlational Trends
between Boys and Girls

	Adaptive Regression Score		
	Boys	Girls	Z+
Aggressive Content	-.47*	.56**	3.09***
Content Level 1	-.45*	.32	1.76*
Content Level 2	-.39	.59**	3.00***
Formal Level 1	-.04	-.13	.24
Formal Level 2	.42	.37*	.08
Libidinal Content	-.34	.60**	2.84***
Defense Demand	-.17	-.23	.21

	Defense Effectiveness		
	Boys	Girls	Z+
Aggressive Content	-.42	.42	2.43**
Content Level 1	-.24	.11	.97
Content Level 2	-.36	.59	2.87**
Formal Level 1	-.18	-.52	1.05
Formal Level 2	.47	.29	.57
Libidinal Content	-.21	.52	2.11**
Defense Demand	.66	-.52	3.19***

*Significant at .10
 **Significant at .05
 ***Significant at .01

TABLE 14

Differences in Correlational Strength
of Individual Piaget Scores

Mean Piaget Score	r		r	t
Moral Judgment	.91	Class Inclusion	.65	4.18**
Moral Judgment	.91	Seriation	.67	4.20**
Moral Judgment	.91	Length	.67	4.17**
Moral Judgment	.91	Horizontalness	.75	3.05**
Moral Judgment	.91	Area	.81	2.39*
Moral Judgment	.91	One to One	.81	2.39*
Moral Judgment	.91	Matter	.89	.64
Matter	.89	Class Inclusion	.65	3.65**
Matter	.89	Seriation	.67	3.49*
Matter	.89	Length	.67	3.53**
Matter	.89	Horizontalness	.75	2.58**
Matter	.89	Area	.81	1.62
One to One	.81	Class Inclusion	.65	1.84*
Area	.81	Class Inclusion	.65	1.85*
One to One	.81	Seriation	.67	1.66
Horizontalness	.75	Class Inclusion	.65	1.00

*Significant at .05

**Significant at .01

TABLE 15

Correlations between Piaget Tasks
and Primary Process Variables

Variable	Mean Piaget Score	Piaget Rank	One to One	Matter	Length	Class In- clusion	Moral Judgment	Horizontality	Serialization	Area
Form Level	50	56	52	42	24	57	42	42	34	31
Defense Effectiveness	31	40	27	30	22	37	19	25	24	17
Control-Defense Plus	36	34	41	33	06	51	23	22	20	30
Control-Defense Total	52	56	45	46	21	62	40	28	31	51
Adaptive Regression	39	45	34	29	19	47	29	38	31	30
Pripro Level 2	38	26	20	32	31	23	37	21	16	46
Content Level 2	42	39	28	39	25	45	33	25	11	50
Goldberger Control	20	28	17	09	-08	47	19	24	24	08

$p=.05, r=.27$

$p=.01, r=.38$

TABLE 16

Differences in Correlational Strength between Mean Piaget Score and Class Inclusion across Primary Process Variables

Variable	Mean Piaget Score	Class Inclusion	t
Goldberger Control	.20	.47	2.46*
Defense Effectiveness	.31	.47	1.26
Control-Defense Plus	.36	.51	1.15
Pripro Level 2	.38	.23	1.03
Control-Defense Total	.52	.62	.97
Adaptive Regression	.39	.47	.68
Form Level	.50	.57	.68
Content Level 2	.42	.45	.21

*Significant at .05

TABLE 17

Differences in Correlational Strength between Mean Piaget Score and Length across Pripro Variables

Variable	Mean Piaget Score	Length	t
Form Level	.50	.24	2.18*
Defense Effectiveness	.31	.22	.97
Control-Defense Plus	.36	.06	2.49**
Control-Defense Total	.52	.21	2.63**
Adaptive Regression	.39	.19	1.64
Pripro Level 2	.38	.31	.90
Content Level 2	.42	.25	1.58
Goldberger Control	.20	.08	1.23

*Significant at .05

**Significant at .01

TABLE 18

Comparison of Means between Holt, Matalon, Safrin,
and Wulach Primary Process

	Safrin Oedipal	Wulach Preoper- ational	Wulach Transi- tional	Wulach Concrete	Safrin Latency	Matalon 10-year -olds	Safrin Adoles- cents	Holt's College
Average Age	4.87	5.42	6.95	8.10	8.85	10.0	13.9	College
Pripro Levels 1+2	49.7	32.3	48.9	50.0	46.3	45.4	49.6	54.2
Pripro Level 1	n.g.	18.6	19.4	25.2	n.g.	7.6	n.g.	16.0
Formal Levels 1+2	15.8	14.2	25.5	27.7	26.7	16.5	23.5	29.3
Content Levels 1+2	26.0	19.2	33.8	37.3	30.3	36.7	36.8	41.7
Defense Effectiveness	.23	-.20	.59	1.05	.71	.74	.54	.8
Content Level 2	n.g.	19.2	32.9	37.8	n.g.	35.2	n.g.	n.g.
Pripro Level 2	n.g.	17.6	34.2	34.4	n.g.	41.8	n.g.	49.0
Form Level	n.g.	3.40	4.51	4.91	n.g.	4.80	n.g.	n.g.
Defense Demand	n.g.	2.22	2.19	2.35	n.g.	2.03	n.g.	2.3
Adaptive Regression	n.g.	.33	1.31	1.88	n.g.	1.39	n.g.	n.g.

n.g. = not given