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THE CONCOMITANT DEVELOPMENT OF COGNITIVE AND MORAL
MODES OF THOUGHT: A TEST OF SELECTED
DEDUCTIONS FROM PIAGET'S THEORY

DISSERTATION
Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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* * * * * *

The Ohio State University
1968

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INTRODUCTION

The present study is concerned with discovering how cognitive development, as defined by Piaget's theory of cognitive stages, is related to the development of moral judgment. It is also concerned with testing Piaget's concept of the fixed sequence of changes in the stages of cognitive and moral development. That is, in the realm of cognitive development, the school age child progresses from a stage of pre-operational thought to that of operational thought and finally to a stage of formal operational thought. In the realm of moral development, the child progresses from a stage of heteronomy to one of autonomy.

In past studies of the socialization process, investigators have utilized three different approaches to the study of moral development, each emphasizing different aspects of moral functioning: moral conduct, moral emotions (guilt) and moral judgment. Moral conduct and emotions do not readily lend themselves to developmental analysis. However, the research of Piaget (1932) and Kohlberg (1958) has shown that moral judgment can be conveniently divided into specific developmental stages.

Recent trends as reviewed by Kohlberg (1964), in the study of the development of moral judgment have focused on concepts presented in Piaget's (1932) classic treatise, The Moral Judgement of the Child. Piaget suggested that the development of moral judgment followed an orderly sequence, where a child goes from a stage of heteronomy to one
of autonomy through the process of differentiation and integration. For Piaget, moral judgment is based upon the changing cognitive structure of the child's mind, and the external factors of adult constraint and peer group influences. However, the basic tenet in Piaget's analysis is that the effects of such external influences necessarily covary with the changing cognitive structure of the child's mind. Changes in cognitive structures are conceptualized as progressing through sequential stages of development. If the child has not reached the stage of cognitive capacity that permits certain external influences to be assimilated, their effects cannot be accommodated by developing cognitive structures. Thus, Piaget is asserting that growth in moral judgment is necessarily a concomitant of intellectual development.

Much research has been generated to investigate the influence of constraint and peer cooperation in relation to the development of a child's moral judgment (Harrower, 1934, Johnson, 1962, MacRae, 1954 and others). However, the relationship between levels of cognitive development and moral judgment has not been studied. This neglect is rather puzzling, as Piaget emphasized that changes in cognitive structure are the sine qua non of the development of moral judgment. Investigators who have studied cognitive capacity and its relationship to moral development have unfortunately defined cognitive capacity in terms of performance on standardized intelligence tests. Such a definition is inadequate and inappropriate for the study of cognitive changes as conceptualized by Piaget and its relationship to moral
development. For example, an IQ score is merely a special measure of achievement. Its relationship to the dimensions of cognitive growth postulated in Piaget's theory has not been well established. Operationally, it is difficult to view IQ as a process of this conception of cognitive change, since performance on a standard intelligence test is a cumulative summation of performances on various tasks or the summed consequences of discrete learning experiences. The IQ is defined by specific items derived from age norms and is not designed to differentiate qualitative changes in cognitive structure. Furthermore, comparisons of bright, average, or subnormal children do not in themselves constitute an index of development and cannot therefore throw light on how differential developmental rates in cognitive capacity relate to the growth of moral judgment.

For many years investigations on moral development were dominated by practical concerns about ethically good behavior. It has only been during the past two decades that interests have become more focused on basic theoretical issues related to moral development. Initially, theoretical approaches to moral development had their base in Freud's concept of the conscience. Conscience, according to Freud, was a set of internalized cultural rules. These rules were said to be internalized if they were conformed to in the absence of situational incentives or sanctions, thus, these conformities were said to be intrinsically motivated. However, the classic investigations by Hartshorne and May (1927) weakened the generalization that moral behavior is an inner entity, operating independently of the situations in which the
individuals are placed. Since Hartshorne and May found conformity to rules and moral standards varied as a function of interactions among a host of situational and personal factors, the idea of a unitary, fixed moral faculty was no longer tenable.

Thereafter, investigations dealing with moral development tended to focus on behavioral aspects of morality, e.g., response to transgression (Aronfreed, 1961, 1963, 1965), resistance to temptation (Grinder, 1962, 1963) and other behaviors which purported to reflect children's internalization of moral standards.

After Hartshorne and May publications appeared, Piaget published his book on *The Moral Judgement of the Child* (1932). His work was fundamentally concerned with changes in attitudes toward rules and the development of capacities for moral judgment. The importance of Piaget's contribution rests in its concern with the total ontogenesis of children's thinking, and his recognition of the relevance of situational factors.

Piaget (1932) reported that the development of moral judgment in children followed an orderly progression based on the child's cognitive development and the nature of his relationships, first with his parents and adults and then with his peers. His conclusions were based on analysis of children's (offspring of working-class parents in Geneva, Switzerland) responses to questions concerning the nature of moral responsibility and punishment.

According to Piaget's theorizing, two broad stages of moral development are present in children's moral judgments. The first stage, which begins at about age two, he called "moral realism." At this
stage, moral rules are realistic in the sense that they are accorded the status of physical laws. Applications of these rules are rigid and inflexible and are measured in terms of their objective outcomes. Every act is stressed and evaluated independently of its context or intentions. According to Piaget, moral realism is the product of the combined influence of egocentrism and relationships with adult's continual constraint. As Piaget (1932, p. 159) states:

...moral realism is the result of the meeting of egocentrism and constraint. The child, owing to his unconscious egocentrism, tends spontaneously to alter the truth in accordance with his desires and to neglect the value of veracity. The rule that one must not lie, imposed by adult authority, will therefore seem all the more sacred in his eyes and will demand all the more "objective" and interpretation just because it does not in fact correspond with any felt inner need on his part.

At about the age of eleven, moral realism gives way to a second stage which Piaget characterized as "morality of equity." At this stage, judgments are based on the subjective factor of intent rather than on objective outcomes. This morality is flexible rather than absolute. Its goal is the preservation of the equalitarian rights of others. Therefore, rules are respected because of their social functions, not merely because they exist. Rules are thus transformed from mystical authoritarian commands into internal principles.

The morality of equity develops as mental functions and social experiences of the child undergo change. As egocentrism is overcome, the child is aware of other viewpoints and is able to influence his judgments by considering other positions and mitigating situational factors. Since actions are no longer isolated from their context, the
complexity of judgment increases. At the same time, the child partici­
cipates in rule making and enters into reciprocal relations with peers. 
These broader social experiences aid in the child's development of a 
sense of autonomy. As these experiences consolidate, the child attains 
an ability for cooperative relationships with peers. At the same time, 
his relationships with adults are changed. Such relationships are 
characterized by cooperation rather than by constraint. As the child 
grows, his cognitive capacity develops, the development of cooperative 
relationships are interrelated with this cognitive growth, all of 
which lead to more mature moral judgments.

The ability of the child to incorporate such influences which 
effect the progressive shift from egocentrism to cooperation in the 
realm of moral judgment will depend, in the main, upon the level of 
cognitive development reached by the child.

In order to understand better the role that cognitive functioning 
plays in the development of moral judgment, certain aspects of Piaget's 
theory of cognitive development are first examined. For example, what 
does Piaget mean by intelligence, and how does he view its process of 
growth?

Piaget has proposed a novel and provocative new approach to the 
concept of intelligence. He believes that in order to understand the 
development of intelligence one must first understand its developing 
structures, functions, and resulting operations. The attainment of 
knowledge is not merely an imitation of experiences, to know an object 
or event is to act upon it and not simply replicate a mental image of
it. To act on an object is to modify and transform the object. Piaget's aim is to understand the process of such transformations to identify their underlying structures. For example, an operation consists of ordering or putting things in a series, or joining objects in a class to construct a classification. Therefore an operation is essentially the essence of some knowledge. Operations are internalized actions. Such actions have a major theoretical property which Piaget terms reversibility. Reversibility indicates that a cognitive process can take place in opposing directions, i.e., adding and subtracting, joining or separating, etc. Thus, it is a set of particular actions that makes up a logical structure. However, such operations do not exist in isolation; they are always linked with other operations because they are a part of a whole structure, i.e., a class does not exist in isolation but rather, it is a part of the total structure of classification.

To Piaget, it is these operational structures which constitute the basis of knowledge or intelligence, what he calls the "natural psychological reality." Therefore, the central problem in understanding intellectual development is to understand the formation, elaboration, organization and functioning of these cognitive structures.

The development of these structures in Piaget's theory starts at birth and progresses in an orderly manner through different stages until maturity. In his various works (1950, 1967b) he distinguishes three main stages of development. The first is a sensory-motor, pre-verbal stage which lasts approximately through the first 18 months of life. The infant comes into the world with two kinds of reflexes—
those that are not alterable by experience, such as knee jerks, Babinski, etc., and those that are modifiable by experience, such as grasping and sucking, etc. It is during this stage that practical knowledge is developed through the use of these modifiable reflexes. Using these reflexes, the infant carries on countless transactions involving space, time, matter, etc., which build and reshape the developing structures. These developing structures are the foundations which form the substructure of later representational thought. For example, this is evidenced in what happens with respect to the concept of object permanency. In the early stages of development, when an object disappears from the visual field, it no longer exists for the infant. Therefore he makes no effort to find it. As the infant develops, he will try to find the displaced object for he knows that the object continues to exist. The infant must carry out a physical search for the displacement in his actions rather than in covert thought processes, for he cannot represent the displacement in his mind. He finds it by localizing it spatially through sensory-motor processes. Thus, along with the construction of object permanency, there comes the construction of practical or sensory-motor space. Piaget postulates that these series of actions which form the basic structures are indispensable for the structure of later representational thought.

The second developmental stage consists of a period of formation and a period of attainment. The period of formation is characterized by pre-operational representations. Here the beginnings of language
and symbolic functions take place, therefore, the beginnings of thought and conceptual representations. At this level of representational thought, a reconstruction of all that was developed during the sensory-motor level takes place, for the sensory-motor actions are not immediately transformed into operations. During this period of pre-operational representations, there are no "operations" as yet. Specifically, conservation, the prime criterion for the presence of reversible operations is not yet present in the child's cognition. For example, two beakers are presented to a child with equal amounts of liquid in each. Then, if the liquid of one beaker is poured into a differently shaped beaker, the pre-operational child will think there is a different quantity of liquid in each. The child centers on one variable only, usually the variable that stands out visually: he lacks the ability to coordinate different variables. The child essentially is unable to perceive the logical necessity that the quantity has not changed, and thus, has to be equal. It is difficult for the child to go beyond his perceptions and perform displacements on the data in his cognitive domain. In the absence of operational reversibility, there is no conservation of quantity.

Through the long process of elaboration and reconstruction of existing structures (to be discussed fully later), mental operations emerge in the form of reversible processes. However, such operations are concrete in nature because they operate only on objects and not on verbally represented hypotheses.
These mental operations, in contrast to those involved during the first stage of sensory-motor actions which are executed in succession, operate in a complex network of systems in which many operations are carried out simultaneously. These latter systems of operations are characterized by the presence of two forms of reversibility—negation, or inversion, and reciprocity. Negation can be illustrated in the conservation of liquid experiment where a perceived change in form is cancelled by its corresponding "negative" thought operations. At this level, negation is applied to the classificatory operations. Reciprocity is the attainment of the concept that relationships are relative, e.g., a Chinese is a foreigner to an American, and vice versa. These systems of operations at this stage are still incomplete, for the two forms of reversibility are independent of each other, i.e., in a given situation, the child can attain either one or the other reversible operation but not both simultaneously.

Finally, in the third stage, this limitation to concrete operations is removed and the two forms of reversibility are united into one operation. At this point in development, the child reaches the level of formal hypothetical deductive operations. The child can now reason about hypotheses and is not limited to objects. He can construct new operations and can then systematically combine the propositions so as to test all possible combinations. This double reversibility permits a greater degree of mobility and coherence of formal thought.
Piaget identifies the interactions of internal and external factors as influencing an organism's transition from one stage of development to another. Maturation is an internal factor, while social and physical learning are external factors. However, these factors, although necessary in the process of development, are inadequate in themselves to account for the changes in cognitive structures. For Piaget, the concept of equilibration plays the major role in the development of structural change.

Piaget reasons that, if development depends upon both external and internal factors, there must necessarily be a process which provides a balance and integration of these factors. For when a child is in the process of knowing, he is active, and therefore he is faced with an external disturbance. He has to react in order to compensate for this disturbance. Those processes which a child uses for compensation are composed of two poles, assimilation and accommodation. When a balance is achieved between these two functions, the end product is equilibrium.

Piaget views the process of equilibration much in the same manner as it is used in cybernetics; that is, it is a process, with feedback and feedforward loops, regulating itself by a progressive compensation system. Assimilation can be viewed as the process of feedback and feedforward, where the individual attempts to integrate each successive experience into a personally meaningful system. Such experiences are based upon the various operations the individual performs upon his environment and must be consistent with his present
structure. Accommodation can be viewed as the compensatory system whereby the individual's cognitive structure is altered in response to these assimilated actions. It is this equilibrium between assimilation and accommodation that explains the reversible operations; that is, transformation in one direction is compensated by a counter-transformation. In essence, this is a continuous process of self-regulation, and for Piaget it is the fundamental factor in development.

Although the constructs of assimilation and accommodation are the basic processes that Piaget emphasizes in the transition of stages, and which result in equilibration, decentration is a basic adjustment that must be attained in order to achieve equilibration. This mechanism of decentration is essential, for it promotes changes in the balance between assimilation and accommodation in developing new forms of equilibrium.

The basic principle is that the child begins any operation in terms of centration, of self, of objects, etc. For example, during the initial period of sensory-motor development, the child views the world as a series of momentary and moving pictures—there is not one, but a series of spaces centered around the child's own body. Causality to the child may be only actions that he exerts, these actions being neither objectified nor localized. However, as the child develops and attains the final period of sensory-motor development, the world is seen as one space, one causality between objects, and decentration from the self takes place, and thus, object permanence emerges.
Such is also the case during the second stage of development when the child, although decentered from the self, is perceptually centered on certain attributes to the exclusion of others. Decentration has to be attained before reversible thought processes can take place. This is evidenced in the conservation of liquid experiment mentioned earlier. In that process, the child is first exclusively centering on the height of the liquid and ignoring the size or shape of the container, thus each centration is exclusive of the other, and the two attributes are never joined. In the next step, the child succeeds in joining the two attributes, but he has not yet grasped their seriality. In the final step, the child is capable of not only shifting his focus from one to the other and viewing them jointly, but he is also capable of viewing successive transformations. However, even at this stage, the child is centered on objects. He has to overcome this centering on concrete events in order to move into the next stage of formal operations.

As each process of decenteration takes place, the child moves from one focus to another; i.e., from self to immediate realities to abstract conceptualizations. Thus, a higher level or greater capacity for judgment emerges.

If cognitive development is but a compensatory process of self-regulation which in turn is influenced by maturation and learning, how are differential developmental rates explained? Piaget (1962) postulates that there are two aspects to the formation of structures, one is cognitive and the other, affective. Affect, according to Piaget, is
the force or energy behind behavior. The development of affect can either accelerate or retard the formation of cognitive structures. As Piaget points out, this is evidenced in the research on hospitalized infants by Spitz and Wolf (1946), where the normal affective relationship between mother and child is necessary. Intellectual development is retarded if the mother-child relationship does not occur.

Since cognitive structures are based on actions, all behavior then, has a cognitive base. However, for a behavior to emerge, there must necessarily be a force which activates the actions involved. This force is what Piaget terms, affect. Also, the development of affect does not precede or follow the formation of cognitive structures, but develops in conjunction with these structures.

Piaget refers to the construction of objects as the formation of cognitive structures or schemata, and the development of affectivity as the object relationship. Thus, feelings, emotions, motivation, etc. explain the interest for the object but the structure or schemata of the object itself is related to time, space, and causality. This is consistent with his basic tenet that intelligence is derived from operations which are actions—to exert actions one must be interested, motivated, etc.

It is from this affective aspect of the formation of structure that moral development eventually emerges. The first appearance of moral development is in the form of moral feelings. Its initial development begins when symbolic functions and representations emerge (the formation period of concrete operational thought). The child's
thoughts are partially tied to language which involves inter-individual communications and is, therefore, no longer individualistic. From representational thought there is representational affect—effects that are tied to inter-individual values, values beyond the perceptual field. Piaget explains that these infantile moral feelings develop through elements of reaction, what he terms **schemata of reactions**. These are equivalent to sensory-motor schemata, except they are more complex because the child has already reached the level of representational thought where schemata of objects and of persons already exist. This is well documented in Murphy's (1932) publication of sympathetic behavior of children.

These schemata of reactions are simultaneously cognitive and affective. For example, the schemata of submission, obedience or rebellion, with all the feelings attached to them are schemata of reactions that are acquired through contact with parents. Such schemata are related to persons in the same manner as schemata of objects, since people are centers of causality and are the source of all kinds of cognitive ideas as well as of feelings. Thus, the permanence of such infantile feelings would be contingent upon the permanence of the schemata involved. Such permanence is assured every time a similar situation occurs, for it would elicit a reconstruction of similar feelings as a function of the schemata. For example, the child submits to or rebels against a teacher who resembles his mother—the permanence here is essentially a permanence of reaction.
If affective development is thus interpreted, then Piaget has to equate a process in the affective domain which corresponds to reversible operations in the cognitive sphere. A reversible operation is an action that transforms reality while conserving one aspect of this reality. Piaget reasons that in the affective field, there is conservation since equivalent operational structures do exist. Moral feelings can be viewed in terms of conservation of values where the process involved is analogous to logical structures in the cognitive field. The basic structures imposed are values instead of verifications, and this process is called "obligation." Moral obligation would therefore consist of conservation of values.

How then does this relate to the development of moral judgments? Moral feelings, as previously stated, emerge when the child attains some form of symbolic functions, therefore it probably occurs during the very early formation of concrete operational thought, i.e., the pre-operational period. The child must have some kind of representational thought, or moral feelings cannot emerge.

During the sensory-motor period, the child develops an affective schemata (object-relationship) where the object is the mother. The first moral feelings emerge from this relationship when discipline is imposed by the mother who demands unilateral obedience. Thus, the centration here is on adult authority. During this initial stage of pre-operational functioning whenever moral feelings do exist, conservation is absent. A child at this stage can abide by certain rules imposed by parents, but the permanence of the reaction is not yet
established. When the parents are absent, these rules are not followed, for there is no material control. Rules imposed and carried out during this period are not generalized, and thus, are not conserved. For example, Piaget found that children during this period feel that to tell the truth is an obligation toward parents, however, they can lie to peers since this has never been forbidden. Instructions not to lie are accepted at a particular time, or for a particular situation without any kind of generalization. Due to the child's lack of conservation, i.e., reversible thought operations, such moral demands are "external" to the child and therefore appear to him as though they were physical phenomena. Although these moral feelings are not conserved, they are essential for the formation of future structures.

Through the processes of assimilation and accommodation in response to external disturbances caused by general environmental demands, and the concomitant growth of cognitive structures where operations exist and conservation is attained, new moral feelings emerge in the form of reasoning and judgment in relation to the real and the concrete. These new moral feelings are equivalent to conservation in the field of intelligence. (This is perhaps the first emergence of judgment.) The child at the same time attains decentration from authority in the form of reciprocity. For example, a child may first learn to share his toys through the demands of the mother. The actions the child carries out at first are not because of an underlying understanding of the basis for sharing, but rather an unilateral obedience to the mother. However, when the mother is
absent, the child ceases to share his toys, and peers' reactions to his unwillingness will cause a "disturbance" state in the child in terms of their unwillingness to play with him further. Repeated disturbances of this kind are finally equilibrated through assimilation and accommodation until the child reaches a cognitive capacity for reversible thought operations. He is then able to conserve the action of sharing (no longer due to external forces from parents) through reasoning and reciprocity, resulting in a basic understanding of mutual cooperation. Such reciprocal morality is also an autonomous morality, since it is no longer related to transactions between authority and the child, but between peers on an equal basis. However, at this initial stage of autonomous morality (as opposed to the ideological stage of autonomous morality) the child is now centered on the real, the immediate, and the concrete situations with their associated inflexibility. This inflexibility is illustrated in the prominence of the feeling of justice in interactions between children of the same age.

With the attainment of formal operational thought, the child becomes capable of reasoning about different hypotheses, not just the immediately real and the concrete. New moral feelings are added to and integrated with the preceding feelings, all of which correspond to these new operational structures. Due to the mobility and flexibility of thought at this more advanced stage, feelings become decentered from persons or material realities and become more adequate for dealing with social realities, ideal realities, e.g., humanitarianism, which is the ideological stage of autonomous morality.
Piaget's postulates and hypotheses have led to numerous research studies. Since Kohlberg (1963, 1964) has reviewed these studies in great detail, the present review will deal only briefly with studies which were designed specifically to test the developmental aspects of Piaget's theses. Most investigators have studies specific dimensions of moral judgment as defined by the observable aspects of children's definitions of right and wrong and their attitudes toward rules. These studies have generally searched for age changes of more "mature" responses on specific dimensions of moral judgment.

MacRae (1954) and Medinnus (1962) found that objective responsibility increased monotonically with age, that is, with increasing age, acts are judged in terms of intentions rather than consequences. Other studies have noted a positive relationship between objective responsibility and intelligence and social class (Boehm, 1962, Johnson, 1962). The dimension of unchangeability of rules has been found to be related to age, intelligence and social class (Bobroff, 1960, MacRae, 1954, Lerner, 1937).

Kohlberg (1958) and Boehm (1962) showed that with increasing age there is a decreasing tendency for children to define moral wrongness by reference to punishment. Harrower (1943) and Johnson (1962) found that with increasing age belief in expiatory justice gives way to a more restitutive justice and that such changes are related to intelligence and social class. Medinnus (1959) and MacRae (1954) also found that young children believed that deviant acts will cause Nature or physical things to injure the culprit. However, such beliefs in imminent justice give way to beliefs in naturalistic causality as
children grow older. Johnson (1962) and Abel (1941) found the dimension of imminent justice to be related to intelligence and social class.

Since these more mature moral responses were positively related to age in a linear manner, Kohlberg (1963) postulated these above dimensions of moral judgment to be "genuinely" developmental, and further stated that these positive relations are probably due to basic underlying cognitive factors.

The basic dimension of reciprocity, which Piaget postulated as an important factor in freeing the child from egocentricity and moving him to a centration on other realities of mutual respect and peer orientation, has been shown by Kohlberg (1958) to increase until the age of 10 but decrease thereafter until the age of sixteen. However, it should be noted that reciprocity in these studies refers basically to conformity toward peers as opposed to authorities and deals mostly with immediate situational realities. These findings have been generally supported by Morris (1958) and Durkin (1959). Kohlberg (1963) has reasoned that such decreases are contradictory to the concept of "genuine" developmental dimensions and that, therefore, Piaget's autonomous stage is not developmental in nature. Kohlberg has further reasoned that reciprocity, being less cognitive, might account for no age changes as found by Morris and Durkin.

Perhaps to understand better Kohlberg's reasoning, one has to examine what he means by genuine developmental dimensions. Kohlberg
(1963, p. 317) states:

By a genuine developmental dimension of moral judgment is meant a dimension of response which increases regularly with age, regardless of the particular cultural rules or situations which children are questioned about, regardless of the child's cultural milieu, and in which a substantial portion of other favorable social factors which influence the response are expected to influence it in the same way age does, i.e., by stimulating an increase on the dimension.

Such a definition of a "genuine" developmental dimension may be unfortunate. Chronological age certainly cannot be the ultimate determinant of psychological development. This is amply demonstrated in physical development, where a growth process may at first increase with age and, at a later point, decrease with age. Nevertheless, physical growth is still a developmental variable. Likewise, cognitive development does not necessarily increase monotonically with chronological age. Kohlberg's definition seems to be in contradiction to Piaget's basic thesis of structural change which involves continuous processes of assimilation and accommodation, all of which would certainly seem to involve increases and decreases of certain structures in order to attain equilibration in the form of a higher order structure. Piaget's concept of moral development is contingent upon these structural changes within the growing child. It is well to remember that for Piaget, age is not the determining factor of development, but only a general guideline.

Specific to the dimension of reciprocity, Piaget postulated it as an initial period of the development of autonomous morality. As the child proceeds toward formal operational thought, his ultimate
achievement in moral development is not reciprocity per se, but rather, an ideological morality where a decline of reciprocity, as defined by peer cooperation and immediate situational cooperation, may or may not occur, depending upon the child's experiences and level of cognitive functioning. Thus, one would expect that an individual who has attained a cognitive capacity for formal reasoning, and adequate environmental interaction where he is able to decenter his feelings from persons or material realities, would exhibit a decline in reciprocity type responses. One could then assert that Kohlberg and Durkin have essentially supported Piaget's hypothesis of the concept of reciprocity since they found that reciprocity increases up to the age of ten and decreases thereafter. This is consistent within Piaget's system because it seems that decreases of reciprocity type responses should occur with the onset of formal operational thought.

Furthermore, the factor of cognition is essential to Piaget's concept of reciprocity. Reciprocity in moral judgment is essentially an outgrowth of reversible thought processes in the cognitive realm, where an individual must essentially attain a process for logical relationships in which conservation of relations must be present. Thus, without the growth of reversible thought operations, reciprocity cannot be attained. Therefore, it is inappropriate to speak of reciprocity as being outside the domain of cognitive dimension.

Investigators who have attempted to test Piaget's hypotheses have been concerned mainly with age changes and the effects of external controls, such as authority, social class, etc. on the development of
specific dimensions of moral judgment. Few investigators have attempted to test Piaget's general assumptions of children's progression from one stage of moral judgment to another. Those who have considered stage transitions have studied children's moral judgment within a specific transition period, such as Kohlberg and Johnson who studied school-aged children from age ten to sixteen. MacRae (1954) studied a wider age span (5 to 15) which covered the whole spectrum of stages postulated by Piaget. However, his main interest was with testing the unidimensionality of moral judgment across age and the effects of parental authority on specific dimensions of moral judgment. No one has attempted to relate moral development with the concomitant development of cognitive structures, which is the essential basis of Piaget's theory. Chronological age has been found to be consistently the best predictor of more mature responses in moral judgment. However, chronological age is also a variable having many other factors highly associated with it. One such factor is cognitive structures. Thus, following Piaget's theory, perhaps the greater part of the variance in the obtained relationship between age and moral judgment could be attributed to cognitive changes.
DESIGN OF PRESENT INVESTIGATION

The present study is an attempt to test the fruitfulness of some of Piaget's hypotheses. It was designed to find out whether the growth of cognitive structures and the growth of moral judgment do, in fact, develop concomitantly. This was done by testing each child, ages 5 through 17, on a series of six Piagetian cognitive tasks to determine their level of cognitive functioning. Each child's performance on these cognitive tasks was used to predict his level of moral judgment. Level of moral judgment was determined by his responses to nine different morally conflicting story situations. These stories were designed to measure a child's centration on authority vs. peer cooperation vs. humanitarian acts. Thus, children's cognitive and moral development (with social class, sibling position and I.Q. held constant) was hypothesized to progress sequentially, and concomitantly: 1) from the period of pre-operational thought in which moral judgments are based mainly on authority oriented approach, 2) to the next stage of concrete operational thought where cooperation and reciprocity would be used as a base for moral judgment, and 3) to the stage of formal operational thought where his moral judgments would have an ideological orientation.
Selection of Cognitive Measures

The tasks used to measure cognitive development were selected to define the different stages of its development and to stay as close to Piaget's original concepts and data-gathering procedures as possible. Since the subjects used were children, five through seventeen years of age, their levels of cognitive functioning were inferred as ranging from the pre-operational through the formal operational levels. Since structural changes on the cognitive dimensions, as defined by Piaget, deal essentially with the processes of negation and reciprocity, the tasks were selected on the basis of their adjudged adequacy in defining and measuring such processes.

The tasks used were: conservation of mass and liquid, lateral discrimination, projected space, equilibrium of the balance and projected shadows (described in detail later).

The conservation of mass and the conservation of liquid tasks were selected as representative measures of the negation process. These two tasks have dramatically illustrated children's emergence from the pre-operational to the operational level where reversible thought operations are exhibited by the child's ability to conserve. The operating principle here deals with a child's ability to overcome dominant perceptual cues and to retain perceptual operations mentally in order to invert the final operations to their original form. In the conservation of mass and liquid, the child has to understand that certain properties of an object are invariant (mass or quantity) in spite of perceptual changes in certain other properties of the object.
Therefore, a child achieves conservation of mass when he realizes that the amount of substance (mass) in an object has not changed unless something is added or taken away, even though its form has changed. Likewise, a child achieves conservation of liquid when he realizes that the quantity of liquid has not changed even though the liquid level has changed. He has to realize that the height of the liquid level is compensated for by the diameter of the container, and that nothing has changed, since no liquid has been added or taken away.

Numerous experiments have been performed to investigate the concept of conservation. Some have sought to test the external effects upon conservation of such variables as schooling (Goodnow and Bethon, 1966), pre-training (Wallach and Sprott, 1964), I.Q. (Feigenbaum, 1963), etc. However, the usual emphasis has been to replicate Piaget's experiments in order to test the age at which conservation emerges. In this country, Piaget's concept of sequential cognitive stages has unfortunately taken a secondary role to that of the effects of age. In addition, many have sought to improve on Piaget's clinical methods by standardizing the tasks according to more "experimental" types of approach. Unfortunately, such standardization has often deviated significantly from the path of Piaget's original concept of conservation. As a consequence, different results have frequently emerged from these investigations.

The findings of Bruner and his colleagues at Harvard (1966) and Braine (1959) have placed the emergence of conservation at an earlier
age than that found by Piaget. However, Smadslund (1961, 1962), Elkind (1961a, 1961b) and Uzgiris (1964) have consistently supported Piaget. As Gruen (1966) has noted, such differences in findings probably lie in the diverse definitions of the attainment of conservation. Those who have adhered to Piaget's original concept of conservation have emphasized the logical operations involving reversible thought processes which must be present in the thinking (i.e., verbalization) of the child. Whereas, Bruner et al. have defined a child's attainment of conservation as that point in development where the symbolic mode of thought is dominant over the perceptual mode and therefore the child is required only to make a judgment. Due to these differences in theoretical definitions of conservation, the procedural methods for such tests have necessarily been different.

The present study has tried to adhere closely to Piaget's original tasks, because the purpose has been to test Piaget's basic concepts. Elkind's (1961a) standardized procedures of Piaget's clinical methods were adopted for this phase of the present study.

Elkind presented each child with two clay balls and asked whether the amount of the clay balls would be different if one was rolled into a hot dog (prediction question). The E actually rolled one ball into a hot dog shape and asked whether the two contained the same amount of clay (judgment question). The child was then asked why he gave the answer he did (explanation). The preceding procedures of asking for prediction, judgment, and explanation were used also for the conservation of liquid task. In addition to the above, the present
study added a further test reported by Piaget (1964, 1966). If S gave
an adequate explanation for conservation, he was then asked to make a
ball which contained the same amount of clay as a pancake which served
as a model. In the case of the liquid conservation task, he was asked
to pour the same quantity of water into two differently shaped con-
tainers. This was essentially a check on whether the child could carry
out in actions what he verbalized as reflections of his thought pro-
cesses. Piaget refers to this check as a measure to distinguish
pseudo-conservation from true-conservation.

The reciprocal processes of reversible thought operations have
not been studied as extensively as those of negation in this country.
This development of reciprocal relationships in reversibility requires
that the child recognize that relationships, be they social or spatial,
are relative and therefore can be seen from more than one point of
view. In Piaget's system, the child at first is egocentric and relates
to objects or persons from only his own point of view. He cannot
conceive of perspectives different from his own. However, as intel-
lectual development takes place, the child decenters from the self and
becomes conscious that it is only his point of view he sees, and thus
is aware of other perspectives or other views which are different from
his own. With the attainment of this dimension of reversibility comes
an ability to coordinate different perspectives and different view
points. Lateral discrimination and projected space represent clear
illustrations of this process.
In studying lateral discrimination of children, Piaget (1928) found three stages of development. The first stage spanned ages five through eight years, during which time the child considers left and right from only his own point of view. During the second stage, age eight through eleven years, the child also considers points of view from other persons' positions. During the third stage, eleven years and older, in addition to the foregoing, the child considers left and right from the point of view of objects themselves. For example, if a child in the first stage of development is confronted with a situation illustrated in Figure 1, and he is asked to point to E's left and right, he will respond as though E's right and left are identical to his. It is only when the child reaches the second stage of functioning that he is able to identify them correctly. However, even at this second stage, the child cannot conceive of objects as having left or right. Therefore if he were asked whether the penny is to the left or right of the pencil, he would respond in terms of the object's position itself rather than in relation to another object. This is demonstrated clearly when he is asked whether the key is to the left or right of the penny. His response is that it is neither left nor right, because it is in the middle. It is not until he reaches the third stage of development that he is able to respond correctly.

Elkind (1961a), following Piaget's (1928) suggestions for modifying test items, asked the child to walk around to E's position (Figure 1), and then asked the same questions. Elkind found essentially
FIGURE 1. ILLUSTRATION OF LATERAL DISCRIMINATION TASK
the same age norms. The present study followed Elkind's procedure with one major modification. In Elkind's procedure, after the child was asked whether the pencil was to the left or right of the penny and vice versa, the objects were left untouched, and the child was asked to walk around the table to E's position (Figure 1) and was asked the same questions. The procedural changes in the present study were in asking the child to remain in his original position, but to answer the questions as though he were in E's position. Piaget's intentions were to discover whether the child assumed that objects possessed an absolute or relative position. He noted (Piaget, 1928) that when children say "its to the left," they really mean it is in the absolute sense of the word "left" and not relative to something else. The procedure Elkind used, where a child was asked a question in position A (Figure 1), required that he retain the (position B's) notion that the pencil was on the right and the penny on the left. If the child responded to the absoluteness of the position, he had to memorize the information obtained while in position B with the additional confounding of perceptual factors while in position A. The child at the pre-operational period would logically respond according to his present view. Thus, if the question is to find out whether a child views objects in terms of absolute or relative perspective, it would be more appropriate to ask S to assume position A while he was answering the questions in position B because this would not require memorization. Thus, if the child does not have the concept of relative position, he would be unable to give a different response than the first.
In the area of spatial perception, Piaget and Inhelder (1956) constructed a task to measure the degree of spatial decentration of children. The task consisted of presenting a child with a model of three mountains located at different locations on a flat board. Each mountain differed in shape, size, and color. In addition, each mountain had its own distinctive feature on its summit; a cross, a house, and snow. Piaget was interested in ascertaining whether children could perceive that the view of this mountain scene was different from different perspectives. The basic principle here is that the child is required to free himself from the immediate perceptual impressions, and use what he sees as a basis for a reasoning process to construct an image of how the scene would look from different perspectives. Such an ability will necessitate the formation of reversible thought operations. These operational processes require the child to perform various transformations and counter transformations to arrive at the correct spatial configuration of a particular perspective.

Piaget found that there was a gradual formation of this system of reciprocal relations from age seven through eleven. Although little work has been done in this area, Swanson and Benton's work (1955), where they required children to determine left-right dimensions from photographs, is somewhat analogous. Their findings supported Piaget in finding that this ability increases until the age of eleven.

In the period of formal operational thought, the two forms of reversibility, negation and reciprocity, are coordinated into one system. The child is finally able to use both forms of transformation
simultaneously. Inhelder and Piaget (1958) published a collection of fifteen experiments where they attempted to show the emergence of such structural integration. This was accomplished in terms of structuring certain methods of experimental induction where the subject was required to carry out systematic verifications.

The present study selected two of the experiments which Inhelder and Piaget reported. The equilibrium of the balance and the projection of shadows tasks were used as representative measures of the formal operations period.

In the balance task, Ss were presented with a simple weight balance. The task was designed in a manner which required that Ss understand the relationship between the weight and distance from the fulcrum and the height of the balancing arm. To understand the law governing the balance, Ss must observe the proportional relationship between weight and distance; and in order to explain the law, Ss have to understand the proportional relationship between weight and height.

In the projection of shadow task, the Ss were presented with rings of varying diameters and were required to place them on a peg board between a screen and a light source in such a manner that it would produce only one shadow. The basic principle to solution is that of geometric proportionality where Ss must solve the relationships between distance and the diameters of the rings.

Thus, in both tasks, Ss were required to use double proportionality to understand the basic principles governing them. In the equilibrium of the balance task the Ss must understand that the
relationships between weight \( n \) is inversely proportional to the distance \( n \) and that the force needed to pull it to a certain height corresponds to the distance. In the projection of shadow task, \( S_s \) must understand that the size of the shadow is directly proportional to the diameters of the rings and inversely proportional to the distance between the rings and the light source. Furthermore, in both these tasks, \( S_s \) were required to verbalize the explanations of the working principles involved.

Lovell (1961) replicated a series of these experiments and, with the exceptions of some minor deviations, found generally similar developmental patterns as had been reported by Piaget. Mogar (1960) using kindergarten, second and fourth grade children, found that with increasing age, children tend to give more adequate explanations in the projection of shadow task. Ervin (1960) found that some second and third grade children discovered all four operative variables governing the flexibility of a rod. In further support of Piaget, he found that failure to discover the governing principles was a result of a tendency to repeat unsuccessful predictions, or to focus on a narrow range of hypotheses.

Selection of Measures of Moral Judgment

In the area of moral judgment, the task of selecting appropriate stories for children five through seventeen years of age was a difficult one. Since the present investigator was interested in assessing the child's moral judgment in terms of his level of development in a global manner, rather than on specific dimensions of moral
judgment, i.e., imminent justice, moral realism, etc., Piaget's original stories were not used.

Kohlberg's (1958) general approach to the study of moral judgment seemed most appropriate. He presented Ss (10, 13, and 16 years old) with story situations where a conflict between two legitimate alternatives existed. Ss were required to decide on the solution to the conflicts and to verbalize the reasons behind the solutions. Kohlberg found that the underlying reasons for solution to these conflicts could be divided into six hierarchical levels and these levels of moral judgment were assumed to be developmental in nature because of their sequentiality. Since the stories used by Kohlberg were at too complex a level for the younger Ss of this sample, the present experimenter adopted Kohlberg's method of using conflict situations in adapting or generating short, concise stories that would be comprehensible to five year olds.

The conflict stories were constructed so that the exposure of the different stages of moral development as hypothesized by Piaget would be counter-balanced. That is, the story situations consisted of conflicts between authority-peer orientation, authority-ideological orientation and peer-ideological orientation.
EXPERIMENTAL PROCEDURES

One hundred and ninety-five boys (15 boys from kindergarten through twelfth grade) from the Worthington Schools in Ohio were used as Ss. They were selected on the basis of the following criteria: (1) Caucasians, (2) oldest child in the family, (3) average intelligence or above, (4) living with parents, (5) born in the months of July, August, September, and October (this was done in order to keep the age intervals between grades relatively constant). The age range of Ss was 5 years, 5 months to 17 years, 3 months.

Worthington, a suburb of Columbus, Ohio, is a middle and upper middle class community with a population of 11,000.

Five Ss (1 first grader, 1 fourth grader, 1 sixth grader, and 2 seventh graders) were discarded after they failed to attain a total vocabulary score equivalent to a 10 point scaled score, for their respective age groups, on the Wechsler Intelligence Scale for Children's vocabulary test. Using the ten point scaled score as a minimum performance assured that the Ss would be of at least average intelligence. This minimum performance was required in order to keep the intelligence factor relatively homogeneous.

Materials
Conceptual tasks

Conservation of Mass: differently colored clay (play-doh).
Conservation of Liquid: two, 70 milli-liter jars, 1-1/2 inch in diameter; one cylindrical jar, 1 inch in diameter; two square jars, 1 and 1-1/2 inch square.

Lateral Discrimination: a penny, a pencil and a key.

Projected Space: three rocks (one large pink, one flat long blue, and one small tall green), were pasted onto a one-foot square light green Ozite tile. Further distinctive features were also added. On the summit of the green rock is a red house with a black roof, and with a door and windows painted on it. A path made of cork chips runs down the side of the rock. The summit of the pink rock is snow covered. A big red cross is pasted on the plateau of the blue rock. (The details of this representation are presented in Figure 2.) The scene is surrounded on three sides (positions B, C, D) by a removable black construction paper screen. On each side of the paper screen is a 4 x 5 window; the windows are covered by a paper flap which could easily be lifted. During the experiment, the doll was positioned in these windows and the paper flap rested on the doll's back. This protective screen was used in order to prevent Ss from peeking.

Eight color photographs (3-1/2 x 5 inches) were taken of the mountain scene from eight different positions, one at each side (positions A, B, C, D in Figure 2), and one at each corner (positions E, F, G, H) of the square tile. Four sets of the eight photographs were used. A set consisted of eight photographs representing the eight different positions. These photographs were randomly glued in eight different locations on an 11 x 16 inch white cardboard. Each picture
FIGURE 2. DIAGRAM OF MOUNTAIN SCENE IN SPACE PROJECTION TASK.
(LETTERS REFER TO POSITIONS)
position was numbered for easy identification of locations. A sample of randomly placed colored photographs is presented in Figure 3.

Equilibrium of the Balance: an aluminum ruler, 18 inches in length was mounted on a 3 x 7 strip of plexi-glass by a pivotal bearing. The ruler was covered with white paper and was marked and numbered on both sides, at one inch intervals, from the fulcrum. The weights were made of orange wood blocks suspended from a red-white cord. At the end of the cord was a hook made of a ground lug. Each block was balanced with metal washers to equalize its weights. There were six one-block weights and one two-block weight. The one-block weights could be easily attached to each other by placing the hook of one to the cord of the other, thus, any number block weight could be made.

Projection of Shadows: six rings, with inner diameter of 2.5, 5, 7.5, 10, 12.5 and 15 centimeters were each mounted on an aluminum rod and painted black. A peg board, with holes drilled one centimeter apart, had a removable screen on one end and a removable light source on the other. The 10 x 15 inch screen was made of 1/4 inch thick masonite board and was painted flat white. The light socket was mounted on a piece of plexi-glass behind a 2 inch magnifying lens. The lens served to intensify the light rays. The light source was powered by a D.C. rectifier.

The rings could easily be inserted into the peg board holes at varying distances between the light source and the screen.
FIGURE 3

ONE OF THE SETS OF VIEWS PRESENTED IN
THE SPACE PROJECTION TEST
**Moral Conflict Stories**

The moral judgment measures were composed of three types of conflict situations. The conflict situations were between authority and peer cooperation, peer cooperation and altruism, and authority and altruism. Authority was defined by situations where adult-child cooperation is required, obedience to adult by the child, or obedience to a social rule, i.e., the law. Peer cooperation was defined by child-child cooperation or adult-adult cooperation. Altruism was defined by situations which would require some kind of actions of an individual to alleviate some human suffering; actions that might have unfortunate consequences for the actor. Each type of conflict situation was represented by three different stories, thus giving a total of nine stories. The stories are presented in Appendix A.

Each story was assigned a score corresponding to five a priori set levels of moral judgment based on reasons given for the solution of the conflict situations. The five levels of moral judgment were: (1) authority orientation, (2) authority bound but emergence of reciprocity awareness, (3) reciprocity, (4) rules are for societal order, (5) ideological—based on principles rather than rules. The scoring guidelines to these five levels are presented in Appendix B.

To obtain inter-rater reliability, 26 protocols were randomly selected (2 from each age group) and scored by two independent judges ($r = \cdot85$, $df = 232$). Due to the low response frequency (less than 5% of the total responses) of the level 5 response, the data were analyzed by combining the level 5 and level 4 responses. Thus moral judgment was divided into four different modes of conceptualization.
Procedure

Each S was tested individually. S was seated across a table from E and was first given the WISC vocabulary test. The S was then presented the tasks in the following sequence and procedures.

Conservation of Mass

Two play-doh balls identical in size, shape, and weight were placed on the table in front of S.

Do the balls have the same amount of play-doh, is there as much in this ball as in this one? (For younger Ss, third grade and below, the following instructions were given in addition.) If this was candy, and you eat this ball and I eat this one, will we both have just as much to eat?

S was encouraged to make them the same if he doubted the equality of the balls. When S agreed that the two balls were equal, E proceeded.

Suppose I roll one of the balls out into a hot-dog, will there be as much play-doh in the hot dog as in the ball. Will they both have the same amount of play-doh? For younger Ss only: If I made my ball of candy into a hot dog, will I have just as much candy to eat as you have? Will we both have the same amount of candy to eat?

E actually rolled one of the balls into a hot dog while S watched.

Is there as much play-doh in the ball as in the hot dog, do they both have the same amount of play-doh? For younger Ss only: Do we both have the same amount of candy to eat now?

Why?
If S gave an appropriate response for conservation, E proceeded.

Here is a pancake made out of play-doh also. Can you make a ball that would have the same amount of play-doh in it as this pancake? Make it so that both the pancake and your ball have the same amount of play-doh. O.K.? For younger Ss only: Now, what I want you to do, is to make a ball that has the same amount of play-doh as this pancake. If you eat this pancake, and I eat the ball you are going to make, we will both have the same amount to eat. So make it so that I have just as much to eat as you have. O.K.?

Do you have any questions?

If S had questions or did not understand the instructions, E repeated the instructions.

Lateral discrimination

S was seated across the table from E.

Show me your right hand....your left hand. Now, show me your right leg...your left leg.

Show me my right hand....my left hand. Now, show me my right leg....and my left leg.

Here is a pencil and a penny. E placed the penny to S's left and the pencil to his right.

Is the pencil to the right or to the left of the penny?

Is the penny to the right or to the left of the pencil?

The pencil and the penny were left untouched. Now, let's pretend that you are sitting here where I am, O.K.? For younger Ss only: You stay where you are and pretend that you are sitting here. The above two questions were repeated again.
See this key? I am going to put it here. E placed the key between the penny and the pencil. Now, answer these questions from where you are.

Now, from where you are sitting, is the pencil to the left or the right of the key?
Is the penny to the left or the right of the key?
Is the key to the left or the right of the penny?
Is the key to the left or the right of the pencil?
Is the pencil to the left or the right of the penny?
Is the penny to the left or the right of the pencil?

Now, let's pretend again that you are sitting here where I am, and answer these questions. The above six questions were again put to the S in the same order with the exception that E reminded the S that he was to assume E's position after each question.

Projected Space

The mountain scene was placed in front of S with position A (see Figure 1) facing him.
See these rocks? We will pretend they are mountains. S is permitted to explore the mountain scene visually from position A only, and this is true for all the following questions. (For older Ss, grade 4 and over, the doll was not used. The questions were addressed in terms of having S be the viewer instead of the doll.)

Here is a doll, if he took a picture of these mountains from here (doll was placed in position A), which picture do you think he would have taken? Card 1 was placed before S.
Suppose the doll came around to this window (position B) and took a picture from here, which picture would he have taken? Card 2 was placed before S.

How about if he took the picture from here (position C) which picture would it be? Card 3 was placed before S.

And here? (position D). Card 4 was given to S.

We are going to do this all over again. I am going to show you the pictures again and ask you the same questions, but this time I want you to tell me why you chose each of the pictures. If you want to change your answer, you may. Just let me know. Do you have any questions?

The above procedure was repeated, with the exception that S was required to give some verbal response. If he failed to give the correct response (correct position choice), the paper screen was removed and S was permitted to manipulate and move the model around to examine it for as long as he wished. At the end of his examination, the paper screen was replaced and the same procedure was repeated without requiring the S to explain his choice.

**Balance Task**

The block weights were presented to S and he was permitted to manipulate and examine them for a few minutes.

*All these weights weigh the same. This one is just as heavy as this one. This one weighs twice as heavy as this because it has two blocks on it. Now, if you put two of these (one block weight) together like this, (S demonstrates) it will weigh twice as heavy as*
this one that only has one block and it will weigh just the same as this one that has two on it. So, if this one has two blocks, it will weigh two times as heavy as this one that only has one block, right? Do you have any questions?

Equal weights (one-block) were placed on each side of the scale at marks 1 and 3.

Why is one up and one down?

Can you make it straight?

If S succeeded either by the addition of weights or by moving the weights to different points of the scale on the first try, the next three items were skipped.

Let's take these off and try something else. If I take this one-block and put it here (at mark 2) what must you do to make the ruler straight?

The weights were taken off the scale, and two unequal weights (one two-block and one one-block) were given to S. Can you put these two weights on the scale in such a way so that the ruler will stay straight?

A two-block weight was placed on mark 2 and a one-block weight on mark 2 on the other side. What must you do to make this straight?

A two-block weight was placed at mark 1. Can you make it straight? If S responded by placing a two-block weight on the other side, he was asked whether there was another way to make the scale balance. If he said no, E asked whether it was possible to balance the scale with a one-block weight. If S said no, the task was
terminated here for S. For those Ss who responded positively, the task was continued by E adding a weight at the same mark without removing the original two-block weight. After each successful response—either by trial or error, or by calculation (E noted which), E added another weight until there were five weights on E’s side of the scale. S was required to balance each addition with a one-block weight.

All weights were taken off the scale and a two-block weight was placed at mark 1 again. Balance that for me again, with a one-block weight.

After S responded appropriately, the two-block weight was moved to mark 2, 3, and 3.5 successively. At each trial, the S was permitted to keep trying until he was satisfied with his response.

Now, can you give me a general rule so that I will be able to put these weights on the scale, regardless of what weights I use, and make the scale balance?

After S verbalized the rule, E placed a three-block weight at mark 2.5. I want you to balance this with a one-block weight. You only have one try, so be sure you have the right place on the scale before you put it on. Regardless of whether S made a correct response, he was asked to explain how he arrived at that response. (A series of pictures illustrating a 5 year-old child attempting to balance the scale is presented in Figure 4.)

Shadow projection task: the peg board was placed in front of S with the screen on one end and the light source on the other. E
1. S pushes down on scale. S: "It's straight!"

2. E: "Can you make it straight without your hand?" S moves weights to center.

3. S tries to balance with hand.

4. S moves weights again.

5. S uses hand to balance again.

6. S lifts up on weight S: "There, it's straight!"

Figure 4. Illustration of a five year old child's performance on the balance task.
turned the light on and placed her hand closely in front of the screen. 
See, it makes a shadow when I turn the light on, right? The light was 
turned off.

See these rings? You can take a look at them, we are going to 
use them later. S was permitted to manipulate and examine them for 
a few minutes.

A 5 cm ring was placed in the last hole from the light. If I 
put this ring here and turn the light on, will it make a shadow? The 
light was left off.

The 5 cm ring was taken off the peg board and a 7.5 ring was 
placed in the same hole. Now, if I put this here, will it make a 
shadow?

E held the 5 cm ring beside the 7.5 cm ring. Will these two 
shadows be different?

Why?

If S responded that there will be two shadows, regardless of 
the reasons given, he was asked whether two different sized rings 
could make one shadow. If his answer was negative, the task was 
terminated for him at this point. If his answer was affirmative, he 
was asked why again and the task proceeded.

Three rings (2.5, 5, and 7.5 cm) were given to S. Here are 
three rings. I would like you to try and put these rings onto the peg 
board in such a way so that it will make only one shadow. Do you have 
any questions? The light was turned on. S's placements of the rings 
were recorded. Two similar trials followed using different rings.
Rings 5, 7.5, and 12.5 were used for the second trial and all 6 rings were used for the third trial. A trial terminated when the S was satisfied with his response. At the end of the third trial S was asked to make up a general rule which explained the operations he had performed. After his explanation, S was asked to place three rings (7.5, 10, and 15) onto the peg board and again attempt to make one shadow. However, this trial the light was left off. (A series of pictures illustrating a 5 year-old child attempting to solve the solution is presented in Figure 5.)

**Conservation of liquid**

Two 70 ml jars were placed before S and water was poured into each while S watched. *Do the two jars have the same amount of water in them?* For younger Ss only: *If you were to drink this water and I drink this, will we both have just as much to drink?* If S doubted the equality of the two jars, water was poured into each until S was satisfied that both jars contained the same quantity of water.

*If I pour the water from this jar into this one, E pointed from the 70 ml jar to the cylindrical jar, will it have the same amount of water as that one? E pointed to the other 70 ml jar. For younger Ss only: If you drink this and I drink this, will we both have just as much to drink?*

*Let's do it. Let's pour this (70 ml jar) water into this one (cylindrical jar). Now, do they both have the same amount of water? Do both these jars have just as much water in them? E pointed to the*
1. S concentrates on placing rod in hole.

2. S: "Not one shadow!"

3. S wiggles rings to different angles.

4. S appears perplexed.

5. S wiggles rings a few more times; still perplexed.

6. S gives up.

Figure 5: Illustration of a five year old child's performance on the shadow projection task.
two jars. For younger Ss only: Do we both have the same amount of water to drink? Do you have just as much to drink as I have? Why? If S gave an appropriate conservation response, the next item was administered, if not, the task was terminated for S.

Here are two different jars. The two square jars were placed before S. I want you to pour the same amount of water into each of them. Pour as much water into this one as you pour into that one. I want both of them to have the same amount of water. Do you have any questions? For younger Ss only: What I want you to do is to pour the same amount of water into this jar and that jar, so that if you drink this one and I drink this one, we will both have the same amount to drink, we will both have just as much to drink. O.K.?

Moral Task

I am going to read you some stories. Listen carefully because I am going to ask you questions at the end of each story. Now, there are no right or wrong answers to the questions that I am going to ask you. I am just interested in your opinion. For younger Ss only: You know what opinion means? It means I am just interested in what you think, there are no right or wrong answers to the questions I am going to ask you, I am just interested in knowing what you think is right or wrong. O.K.?

Do you have any questions? Here is the first story. I presented S with a copy of the story and I proceeded to read it aloud.
At the end of each story, S was asked what the main character in the story should do to resolve the conflict and why. At the end of S's response, E asked S whether he had any more reasons; this was the extent of the probe.

The order of story presentation was randomized with the restriction that each of the conflict situations was to appear once within a three story sequence, i.e., all three conflict situations must be represented once every three stories.

The time for administering all the conceptual tasks and the moral stories varied from age to age and from S to S. For the younger Ss it took approximately 40 minutes and for the older Ss it took approximately one hour. However, there was considerable variability depending upon the length of verbalization by S.
RESULTS

Each of the cognitive tasks was scored on a four-point scale. The mean attainment level for the negation tasks for each age group is presented in Figure 6. The scores on the ordinate represent different attainment levels: (1) failed all questions, (2) prediction and verification questions correct, (3) pseudo conservation (acceptable verbal explanation for conservation), and (4) true conservation. As can be seen, both liquid and mass conservation is attained at approximately the same age. By age 6, most children appear to conserve by giving adequate reasons for conservation. However, it is not until age 7, that most children conserve in terms of what Piaget (1964) refers to as true conservation, i.e., given a task, they can perform the operations involved in conservation.

The mean attainment level for the reciprocal tasks of lateral discrimination and projected space is presented in Figure 7. For the lateral discrimination task, the scores on the ordinate represent the following attainment levels: (1) S's confusion of own left and right, (2) he knows his own left and right but he also uses own view for judging left-right of other persons, (3) he can view left-right of others but he does not view the objects as having left or right, and (4) he correctly identifies all left-right situations. Lateral discrimination appears to progress at a slower rate than the negation
FIGURE 6. MEAN ATTAINMENT LEVEL ON NEGATION TASKS FOR EACH AGE GROUP.
FIGURE 7. MEAN ATTAINMENT LEVEL ON RECIPROCAL TASKS FOR EACH AGE GROUP
type tasks but clearly approaches asymptote at about 9 years of age. Some 5 year-old children are still confused as to their own left and right. At age 6 and 7, most children can consider left and right from their own view of left and right only. Although by age 8, children consider another person's view point, it is not until approximately the age of 9 that most children can consider objects themselves as being left or right of something else.

For the projected space task, the scores on the ordinate in Figure 7 represent the following levels of attainment: (1) the subject confuses his own point of view or uses own point of view for all perspectives, (2) he realizes that different perspectives have different points of view but is unable to identify the correct view, (3) after viewing the different perspectives, S is then able to give the correct identification, (4) he spontaneously corrects his own errors during verbalization and/or gives a correct identification at first try. The projected space task tends to progress at a slower rate across age than its counterpart. As can be seen by comparing data presented in Figures 7 and 8, its level of attainment function across age tends to be the same as that for the formal operations. Most five-year-olds when asked why they chose a particular response gave responses totally irrelevant to the situation. For example, they said, "I like that best," or, if given the appropriate response, they responded by saying, "It looks like that." Six-year-olds would try to fit the mountain positions according to the position of the mountains in the chosen pictures. By age 7, children in general were aware of the change in perspective but unable to give the correct choice, even after viewing
the scene from the other perspectives. Eight and nine year old Ss were able to coordinate the different perspectives after permitted to view the scene from that perspective. By age 10, some Ss spontaneously corrected their errors when asked to verbalize the reasons for their choice. It is not until age 12 that most children were able to attain this level of response.

Performance on the formal operations tasks is presented in Figure 8. The scores on the ordinate represent the following attainment levels: (1) S considers one dimension only (usually size in the shadow projection task and weight in the balance task), (2) he considers both dimensions (distance and size in shadow projection task and distance and weight in the balance task), but does not use them simultaneously, (3) he considers both dimensions but cannot verbalize the underlying operating principles involved, and (4) he gives the correct verbalization of rules. As can be seen, these two functions proceed at approximately the same rate across age. Generally, Ss at the lower age levels, 5 to 7 year olds, consider only one dimension. The size of the rings is foremost in the shadow projection task or the weight in the balance task. By age 8 and 9, there is also a general tendency toward the use of the second dimension, that of distance in both tasks. However, although there is a steady increase of the usage of this second dimension, it is not until the age of 13 that these two functions are coordinated and used simultaneously. It should be noted that correct verbalizations of the operative principles were attained by only a small minority of Ss in the whole sample.
FIGURE 8. MEAN ATTAINMENT LEVEL ON FORMAL OPERATIONS TASKS FOR EACH AGE GROUP.
Intercorrelations between the cognitive tests were computed to test for the sequential nature of Piaget's postulated stages of cognitive development. The results are presented in Table 1. The correlations are arranged in accordance with the order of cognitive progression within the Piagetian system—negation, reciprocal, to formal type tasks. The order of the individual tests within each cognitive level was placed according to the attainment sequence. This was done because there is no supporting empirical data for ordering these tests within the different cognitive levels. The important order here is not within individual cognitive levels, but between them. The magnitude of each correlation fits logically into Guttman's simplex correlations where the adjacent tests should correlate highest with each other and the magnitude of the correlations decreases as the distance between test order increases. The correlational matrix presented in Table 1 clearly supports Guttman's simplex notion, thus giving support to Piaget's basic thesis of sequential change.

For the age range used in this investigation, Piaget postulated two distinct structures of cognitive development, that of concrete operations and that of formal operations. The tasks which tapped negation and reciprocal functions are representative measures of the concrete operations. The shadow projection task and the balance task are representative measures of the formal cognitive structures. A hierarchical factor analysis was performed on all the cognitive tasks to ascertain the organizational structure of the cognitive components. After a general cognitive factor was extracted, two specific structures emerged. Table 2 shows the factor loadings from the three orthogonal
### Table 1

**Intercorrelations of Cognitive Tasks**

<table>
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<tr>
<th></th>
<th>Negation</th>
<th>Reciprocal</th>
<th>Formal</th>
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</thead>
<tbody>
<tr>
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<td></td>
</tr>
<tr>
<td>2. Liquid Conservation</td>
<td>972</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>3. Lateral Discrimination</td>
<td>775</td>
<td>809</td>
<td>1000</td>
</tr>
<tr>
<td>4. Projected Space</td>
<td>642</td>
<td>667</td>
<td>773</td>
</tr>
<tr>
<td>5. Balance</td>
<td>509</td>
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<td>691</td>
</tr>
<tr>
<td>6. Shadow Projection</td>
<td>473</td>
<td>510</td>
<td>660</td>
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Table 2

Higher (g) and Primary Factor Loadings on Cognitive Tasks

<table>
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<th>Task</th>
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<th>( 2 )</th>
<th>Communality</th>
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<td>Liquid Conservation</td>
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<td>988</td>
</tr>
<tr>
<td>Lateral Discrimination</td>
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<td>295</td>
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<td>787</td>
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<td>Projected Space</td>
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<td>145</td>
<td>317</td>
<td>733</td>
</tr>
<tr>
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<td>772</td>
<td>-070</td>
<td>526</td>
<td>878</td>
</tr>
<tr>
<td>Shadow Projection</td>
<td>730</td>
<td>-075</td>
<td>506</td>
<td>794</td>
</tr>
</tbody>
</table>
factors—the general and the two specific structures. The general cognitive factor contained loadings on all tasks with the highest contributions from the lateral discrimination task and the liquid conservation task. The first specific structure produced loadings on the two negation tasks with weak loadings on the two reciprocal tasks. The second specific structure produced loadings on the formal operations tasks, with weak loadings on the reciprocal tasks. The communality column in Table 2 is an index of the reliability of each individual cognitive task. This measure of reliability is a conservative estimate, thus indicating that a large per cent of the variance has been accounted for by the extracted factors. These data give support to Piaget's postulation of two distinct components of cognitive operations.

Moral Aspect

The mean frequencies of the different levels of moral modes of conceptualization for each age group are presented in Figure 9. As can be seen, there are differential response patterns across age for each type of moral level. In general, level 1 (authority), and level 2 (authority-bound but emergence of awareness of reciprocity) responses decrease with age, while level 3 (reciprocity) and level 4 (ideal and societal modes of conceptualization) increase with age. However, the present investigator's interest is not in the response of individual moral modes, but rather in the pattern of response change across age groups. Figure 10 clearly shows these patterns of moral modes of conceptualization for each age group. The patterns of moral responses change dramatically between age 5 and 6. By age 6, there
FIGURE 9: MEAN FREQUENCY OF THE FOUR DEVELOPMENTAL LEVELS OF MORAL RESPONSES ACROSS AGE GROUPS
FIGURE 10. MEAN FREQUENCY OF MORAL RESPONSE PATTERN FOR EACH AGE GROUP.

LEVEL 1: AUTHORITY
LEVEL 2: AUTHORITY-RECIPROCITY
LEVEL 3: RECIPROCITY
LEVEL 4: SOCIETAL
is a sudden shift away from the authority mode of responses with reciprocity responses becoming prominent. The pattern of moral responses is relatively stable from age 6 to 10 with a gradual decrease of authority mode of responses and an increase in level 4 mode of responses. During this age period, the dominant mode of response is that of reciprocity. A major shift of response pattern takes place at age 11 where a decrease of reciprocity responses gives way to a sudden spurt of level 4 responses. However, this increase in level 4 responses tapers off and decreases at ages 12 and 13, but regains prominence by age 14 and stabilizes from there on.

Perhaps the different modes of moral conceptualization can best be illustrated by presenting randomly selected verbal responses of some 8s to two of the stories.

Story Situation:

After Dick promised to keep a secret, Harry told Dick that he brought a rabbit to school and hid it in the class room closet. The rabbit somehow got out of the closet and was skipping around the class room. The teacher was very angry because no one was allowed to bring pets to school. She asked each boy and girl whether they knew whose rabbit it was and Dick's turn was coming next. Dick couldn't decide whether he should say that he did not know whose rabbit it was, so Harry won't get in trouble, or tell the teacher and break his promise to Harry.

What should Dick do? Why?

Mark (age 5): You got to tell the teacher, she asked you. (level 1 response)

Tom (age 6): You shouldn't tell on your friend, but if the teacher asks you, you can't lie. (Q) You got to tell. (level 2)

Paul (age 10): Don't tell. You'll be squealing on a friend if you did, and kids hate traitors. Also, he promised not to
tell, and you want him keep your secret sometime. (level 3)

Robert (age 17): Keep the secret. People should consider loyalty to friends and not squeal. Personal friendship should be above any authority. If you go squealing on each other, what kind of a relationship would you have with your friends. Golly, if you can't trust a friend, what is there left? (level 4)

Story Situation:

Mr. Bill was the boss of a big company. He gave his workers the highest pay and used his money to build hospitals and help the poor in his town. One day, a stranger, Mr. Jack, came to town and recognized that Mr. Bill was a man who had escaped from prison ten years ago and the police was still looking for him. Mr. Jack could not decide whether he should call the police and tell them that Mr. Bill was an escaped convict from another state, or not do anything about it, because Mr. Bill was doing a lot of good for the town.

What should Mr. Jack do? Why?

Mark (age 5): Call the police, he is bad. (level 1)

Tom (age 6): Call the police, he escaped from jail. (level 1)

Paul (age 10): Shouldn't call the police. Don't do anything because Mr. Bill has obviously reformed and doing good for other people instead of doing bad things, so he should not be punished anymore. (level 4)

Robert (age 17): Turn him in. It's his obligation to society. If Mr. Bill was doing good things for his town, the court will show mercy. (level 4)

Relationship of cognitive and moral measures

The main interest of the present investigation was to ascertain whether there exists a relationship between cognitive and moral modes of thought, and if such a relationship exists, how do they relate to each other.
Since the interest here is to test Piaget's hypothesis of differential cognitive structures in relationship to the different levels of moral conceptualization, the original cognitive test scores were not used. Factor scores were used because factor loadings are indices of the different orthogonal cognitive components. Factor scores were derived for each S by using the intercorrelational matrix of the cognitive tasks (Table 1) as predictor variables and the extracted factor loadings (Table 2) as the criterion variables. A Wherry Test Selection Method was used in obtaining b-weights on the cognitive tasks for each of the three factors. These weights were then multiplied with their respective test scores for each individual S. A factor score was derived by combining all the weighted scores, whether positive or negative, that contributed to a significant increase in the shrunken R. Thus, each S received a unit score for each of the cognitive components. It is these three factor scores defining the three orthogonal cognitive components of: (1) general cognition, (2) concrete operations, and (3) the formal operations that were related to the various modes of moral conceptualization.

Pearsonian correlations were used to test the relationship between each cognitive component and each individual moral mode of response, thus producing a matrix of simple correlations. Table 3 presents these results with the additional variable of chronological age. The general cognitive component, as an over all predictor, provided the best predictions on all levels of moral conceptualization. Also, the general cognitive component is highly related to age.
Table 3
Correlations of Cognitive Components, Moral Responses and Age
(Age 5 through 17)

<table>
<thead>
<tr>
<th>Cognitive Components</th>
<th>Moral Levels</th>
<th></th>
<th></th>
<th></th>
<th>Chronological Age</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Authority</td>
<td>Authority-Reciprocity</td>
<td>Reciprocity</td>
<td>Societal</td>
<td></td>
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<tr>
<td>General</td>
<td>-704*</td>
<td>-364*</td>
<td>264*</td>
<td>611*</td>
<td>709*</td>
</tr>
<tr>
<td>Concrete</td>
<td>-524*</td>
<td>139</td>
<td>186</td>
<td>064</td>
<td>111</td>
</tr>
<tr>
<td>Formal</td>
<td>-092</td>
<td>-324*</td>
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<td>605*</td>
<td>420*</td>
</tr>
<tr>
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<td>-508*</td>
<td>-388*</td>
<td>133</td>
<td>503*</td>
<td></td>
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</table>

*p<.01  df = 193
The concrete operations component is a good predictor of decrease of level 1 (authority) responses, while the formal operations component is a good predictor of level 4 (societal) modes of responses. The two specific components of cognition are not as highly correlated with age as the general cognitive component. However, all the moral levels are influenced by age. Since both moral and cognitive modes of thought are influenced by increasing age, and the present interest is in observing the relationship between the two modes of thought, an attempt to eliminate their common dependence on age was made. Partial correlations were computed on the significant relationships obtained previously between the two modes of thought. Table 4 presents the first-order correlations between the two modes of thought. The figures in parentheses are the same original zero-order correlations presented in Table 3. As can be seen, the general cognitive component's relationship to the different moral modes of responses have markedly decreased, but its relationships to level 1 (authority) and level 4 (societal) responses are still significant. However, the percent of variance accounted for has decreased substantially; for the relationship to level 1 responses is reduced from approximately .50 to .32 and for the level 4 responses the relationship was reduced from approximately .37 to .15. The two specific cognitive components and their relationships to the various moral modes of response did not change substantially when age was partialled out.

According to Piaget's theoretical conceptualization, age 10 is the approximate time when the onset of formal operations take place.
### Table 4

Correlations of Cognitive Components and Moral Responses with Age Partialled Out (Age 5 through 17)

<table>
<thead>
<tr>
<th>Cognitive Component</th>
<th>Moral Levels</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Authority</td>
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*p < .01. df = 192

Note: Figures in parentheses are the significant zero-order correlations from Table 3.
A scanning of the cognitive functions graphs (Figures 6, 7, and 8) suggests that a definite change of cognitive functions does indeed take place at about that age level. Therefore, the present sample was divided into two subsamples, one made up of Ss age 5 through 10 and the other age 10 through 17 (age 10 group is represented in both subsamples). A post hoc analysis was made of the data. Table 5 shows the relationships obtained between the moral and cognitive modes of thought for the two subsamples. It should be noted that the young group (Ss age 5 through 10) is functioning mainly in the concrete operational mode of thought, where formal operations are as yet undeveloped. Therefore performance of these Ss on the formal operation tasks are at a minimum, thus producing little variance between Ss of all ages in this subsample. Factor scores for the formal operations component are generated by the extraction of S's general cognitive ability from his performance in the formal tasks. This method would produce lower scores for the older Ss since their general cognitive ability is usually greater, thereby explaining the negative correlation between the formal operations component and chronological age. Likewise, the older group (Ss age 10 through 17) should be decreasing in their use of concrete mode of thought and increasing in the use of formal operations. Since all Ss have attained concrete operations while the general cognitive ability of Ss is still increasing across age, the extraction of the general cognitive factor from concrete operations performance would produce negative correlation between the concrete operations component and age.
Table 5

Correlations of Cognitive Components, Moral Responses and Age for the Two Subsamples

Young Group: Age 5 through 10

<table>
<thead>
<tr>
<th>Cognitive Components</th>
<th>Moral Levels</th>
<th>Chronological Age</th>
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<td></td>
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<td>Concrete</td>
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<tr>
<td>Age</td>
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*p < .01  df = 88

Older Group: Age 10 through 17

<table>
<thead>
<tr>
<th>Cognitive Components</th>
<th>Moral Levels</th>
<th>Chronological Age</th>
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<tr>
<td>Age</td>
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<td>-311*</td>
</tr>
</tbody>
</table>

*p < .01  df = 118
In comparing the correlations between the total sample (Table 3) and the young group, age 5 through 10 (Table 5), an increase in the magnitude of the relationship between the general and concrete cognitive components and the various modes of moral responses is observed. The per cent of variance accounted for increased in the relationships between the concrete operations component and the level 1 (authority), level 3 (reciprocal), and level 4 (societal) moral modes of responses. Of particular interest is the dramatic increase in the relationship of the level 3 (reciprocity) mode of moral responses to both the general and the concrete cognitive components. This may be explained by the fact that the frequency of usage of level 3 responses is steadily increasing until the age of 10 and tending to have many fluctuations thereafter. This relationship can be seen in Figure 9. When age was partialled out of both the general and the concrete cognitive components, the relationship between the general cognitive component and the reciprocity moral mode of responses is left with little variance in common. (See Table 6.) However, such a relationship is scarcely affected by age when the concrete cognitive component is used as a predictor. The formal operations component is non-predictive for this sample. This is consistent with the theoretical system used here because the onset of formal operational thought is just beginning at approximately the age 10.

For the older group of Ss, ages 10 through 17, the results presented in Table 5 show the predicted trends, where the general and the formal operations components predict level 4 (societal) moral responses.
Table 6
Correlations of Cognitive Components and Moral Responses with Age Partialled Out for the Two Subsamples

Young Group: Age 5 through 10

<table>
<thead>
<tr>
<th>Cognitive Components</th>
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*p < .01  df = 87

Older Group: Age 10 through 17

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<td>(-257)</td>
<td>(-315)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .01  df = 117

Note: Figures in parentheses are the significant zero-order correlations from Table 5.
When age was partialled out of the obtained significant relationships, little variance was left in common between the general cognitive component and level 4 moral responses, while the formal operations component still predicts level 4 (societal) moral response.

Thus, it can be concluded that the concrete operations components of cognitive functioning is best related to a decrease of authority type responses independent of age, and to concomitant increases in reciprocity responses in the moral mode of conceptualization. The formal operations component of cognitive functioning best predicts the increase of level 4 (societal) responses.

For correlations between individual cognitive tasks and the various levels of moral responses see Appendix C.

Another way to ascertain the relationship between the two modes of thought is to observe the transition functions among them as age progresses. Point-biserial correlations (using a progressive summing of age groups, i.e., age 5 group was compared to age 6 through 17 group, then age 5 and 6 group was compared to age 7 through 17 group, and so forth) were computed for each cognitive task and each moral mode of response. The derived point-biserial correlations were transformed into $z$ scores for plotting the transition functions. Figure 11 shows the transition functions for negation tasks and level 1 (authority) mode of moral response. The transition function is approximately equal, with the greatest transition taking place between age 6 and 7 for both modes of thought. Figure 12 shows the transition pattern of the reciprocal cognitive tasks and the level 3 (reciprocity) mode of
FIGURE 11. TRANSITION FUNCTIONS FOR THE COGNITIVE TASKS OF NEGATION AND MORAL JUDGMENT BASED ON AUTHORITY (SEE P.76 FOR DEFINITION OF TRANSITION FUNCTIONS EMPLOYED IN THIS ANALYSIS.)
FIGURE 12. TRANSITION FUNCTIONS FOR THE COGNITIVE TASKS OF RECIPROCAL OPERATIONS AND MORAL JUDGMENT BASED ON RECIPROCITY. (SEE P.76 FOR DEFINITION OF TRANSITION FUNCTIONS EMPLOYED IN THIS ANALYSIS.)
moral responses. Again the transition functions are almost identical up to the age of 10 and fluctuate thereafter. There is a simultaneous increase of reciprocal functions from age 5 to 6 and another transition taking place from age 6 to 7. Figure 13 shows the transition functions for the formal operations tasks and the level 4 (societal) mode of moral responses. The transition functions again correspond to each other and approaches maximum transition at age 10. The level 2 mode of moral responses was not used in the transitional functions because it is a transitional stage between level 1 and level 3 modes of moral responses.

These findings clearly support Piaget's thesis of simultaneous "growth" of cognitive and moral development. The transition functions are clearly dissimilar from each other within the individual modes of thought but are similar across modes of thought. It has been shown that (1) the cognitive domain of negation is related to a decreasing function of level 1 (authority) responses, (2) the reciprocal cognitive functions are positively related to level 3 (reciprocity) in the moral realm, and (3) the formal operations are related to the level 4 (societal) mode of thought.
FIGURE 13. TRANSITION FUNCTIONS FOR THE COGNITIVE TASKS OF FORMAL OPERATIONS AND MORAL JUDGMENT BASED ON SOCIETAL ORDER (SEE PAGE 38 FOR DEFINITION OF TRANSITION FUNCTIONS EMPLOYED IN THIS ANALYSIS.)
DISCUSSION

In general, the present study supports Piaget's theses of:
(1) sequential cognitive development, (2) sequential moral development, and (3) the concomitant "growth" of cognitive and moral modes of thought.

The age of attainment on the conservation concepts, on both liquid and mass, corresponds to Piaget's findings. These findings also gave some support to Piaget's (1967) contention that Bruner, et al. (1966) and others who have found earlier age attainment of conservation may have done so by employing methodology which results in what Piaget has called pseudo conservation. If the criteria of verification are used as an index of conservation without a check for what Piaget refers to as true conservation, conservation is attained by most six year olds as can be seen in Figure 6 (level 3 responses). It is not until age 7 that most children attain conservation concepts in terms of Piaget's (1964) recommended procedures. Thus, the present study has served to clarify some of the discrepant findings with respect to the attainment of the conservation concept.

The reciprocal task of lateral discrimination corresponds to Piaget's earlier findings in terms of the order of attainment of left-right perspectives. However, there are discrepant findings as to age of attainment of the different levels of lateral discrimination. Most
five year olds are still confused as to their own left and right. Although six and seven year olds can distinguish their own left and right, they usually judge left and right from their own viewpoint only. Most eight year olds can distinguish left and right with respect to other persons, but it is not until about 9 years of age that they master lateral discrimination in terms of attainment of the concept that objects also have left and right. Piaget (1928) and Elkind (1961c) found later age attainment for the onset of these different levels of lateral discrimination. This discrepant finding may be attributed to the nature of the present sample, as Ss are of above average intelligence and are first-born children.

The projected space task produced greatest variability within an age group. Its functions were more similar to those of the formal operations than that of negation, and this can be seen if one compares the functions presented in Figures 7 and 8. This is also apparent in the factor analysis results where the loading of this task was stronger on the formal operations component than on the concrete operations component.

According to Piaget's thesis, reciprocal cognitive structures are a distinct function of reversible thought operations. The fact that it did not factor out does not disprove Piaget's thesis, for the present investigation only utilized two tasks as representative measures of each type of cognitive function. The present findings might be a function of either too few tasks and/or tasks selected at too diverse levels of difficulty. The first possibility is consistent
with the factor analytic findings, because the reciprocal cognitive tasks had weak loadings on both the concrete and formal operations components. This is an indication that it might have factored out into a different cognitive component if more tasks had been available. There is also some support for the second speculation suggested by several investigators (Elkind, 1961a; Uzgiris, 1964) that the attainment age for the different types of conservation differ according to the concepts investigated such as mass, weight, volume, etc. Thus, in future investigation, perhaps it would be desirable to select tasks that are more homogeneous in terms of the "difficulty" dimension, so that there might be more generality across tasks that are supposedly measuring the same process. Also, if one should be interested in ascertaining factor structures, it would be advantageous to select more tasks to represent each of the different levels of cognitive functioning.

The findings of this study on reciprocal cognitive functions could probably best be described in terms of a transitional process between concrete operations and formal operational modes of thought. This is suggested by the results of the factor analysis, where both reciprocal cognitive tasks had weak loadings on the two specific structures as shown in Table 2. The magnitude of the loadings changed on both tasks according to the cognitive component observed. The lateral discrimination tasks had stronger loadings on the concrete component while the projected space task had stronger loadings on the formal operations component. However, it should be noted that the magnitudes of these loadings are rather weak.
The formal operations pattern of development generally supports Inhelder and Piaget's findings. In the balance task, 5 year old Ss will first attempt to straighten out the balance by pushing down on the scale's arm as shown in Figure 4. When this action did not work, S randomly moved the weights until finally he pushed up on the weight as illustrated in picture 6 of Figure 4. Six and 7 year old Ss will use one dimension only. Although Ss are told of the equality of weights, they will ignore the information and proceed to add weights indiscriminately, convinced that the weights are unequal. By age 8 and 9, they are aware that the distance to the fulcrum is also important, but do not observe their reciprocal relationship; thus Ss will move the weights by trial and error to attain the balance of the scale. It is not until age 13, that most Ss observe and use both dimensions simultaneously.

In the shadow projection task, younger Ss will consider the size dimension only. The bigger the ring, the larger the shadow regardless where the ring is placed. Thus, the confusion expressed by the 5 year old in Figure 5 is evident. It is not until the approximate age of 8 that Ss will consider distance as influencing the size of the shadow. However, at this level of development, when Ss are confronted with two rings of different sizes placed at varying distances from the light source, they will revert to the old solution that the size of the shadow depended on the size of the ring. There is a gradual increase of the ability to consider both distance and size simultaneously in order to solve the problem. By age 13, almost
all Ss solved the problem by using both dimension of size and distance.

The present study found few Ss who could verbalize the operative principles governing the solutions to the two problems. This finding is in agreement with Lovell (1961) who also found few Ss who could verbalize the rules. Lovell suggested that formal verbalizations of such principles might have to be taught. The present investigator found that most 13 year old Ss solved the problem but the verbalization of the operating principles was attained by less than 50% of the Ss even at age 17.

Modes of moral conceptualization tend to proceed as Piaget postulated where children first center on authority. As decentration from authority takes place, the new centration is focused on peers, mutual cooperation, and reciprocity. With the gradual decentration of the reciprocity mode of moral responses, a centration of the higher modes of autonomous morality takes place where ideals and societal order become dominant modes of conceptualization.

The findings of this investigation supported Piaget's contention that cognitive development and moral judgment do, indeed, covary according to the different modes of conceptualization within the two dimensions of thought. Thus, it has been shown that children functioning in the pre-operational mode of thought adhere to authority modes of moral conceptualization, while children functioning within the concrete operational mode of thought mostly utilize the reciprocity mode of moral conceptualization. With the attainment of formal operational
mode of thought, children tend to relate to the higher societal realities or ideals as bases for moral conceptualization.

One finding in this study has served to clarify an earlier point of contention with respect to the concept of reciprocal morality. Kohlberg (1963) reported that this dimension is non-developmental in nature, since he could not demonstrate an age relatedness. This measure, indeed, does produce the lowest correlation with age when compared to other levels of moral conceptualization. This can be seen in Table 3. However, when the general cognitive component is used as a predictor of reciprocity responses, a low but significant relationship exists even when age is partialled out. It should be noted that when the sample was split into two subgroups, the group using children age 5 through 10, showed an increased relationship between cognitive components and reciprocity modes of response. This relationship held up and was scarcely affected when age was partialled out. It should also be noted that with this population, there was an increase of correlation between chronological age and reciprocity. This finding is reasonable since reciprocity approaches a maximum at age 10 and shows theoretically inconsistent fluctuations thereafter. Therefore, data gathered from only older age groups might account for the lack of findings by Kohlberg (1958) and Johnson (1962) who used Ss age 10 and above. Furthermore, Piaget's system postulates that reciprocity should occur during the concrete operational period of cognitive development; and by age 10, the onset of formal operations take place. Thus, 10 year olds are beginning to shed the immediate, concrete value judgments in
favor of the more idealistic modes of thought. Findings from the present study have shown that Piaget's conceptualization is plausible since a definite change of both cognitive and moral modes of functioning appear to be taking place during that period.

Since chronological age is undeniably an important variable in any investigation of children's development, one could easily contend that the main variable functioning here is still chronological age. This cannot be denied. The partialling out of the age variable is but a statistical technique—as the variables utilized here are not independent. However, the statistical control of the age variable is equivalent to experimental control in this case because the number of Ss in each age group is constant. In addition, conceptually it is difficult to deal meaningfully with chronological age as a variable, for chronological age is such a broad concept, including many psychological and physical variables that have as yet not been identified. It is these largely unidentified variables that account for the change across age on any dimension of growth and development. There is somehow a tendency to attribute to age some magical quality because one finds relationships and results when age is used as an "independent" variable. This tendency has diverted researchers from trying to identify some of the variables which might account for or contribute to development.

Perhaps the contribution of this study is not so much in finding that cognitive and moral modes of thought do in fact develop concomitantly, which Piaget postulated, as in its efforts to identify some
psychological variables which may be contributing to development. The advantage of being able to identify some psychological variables that are related to development is in its making accessible broader scopes of generality. Using the psychological factor of cognitive level, one could have more generality for prediction which would take into account the effects of these influencing factors. For this particular case, other investigators have found that the age of attainment of conservation concepts varies across cultures dependent upon education, social economic status, I.Q., etc.

One study that could be generated from the present investigation is that of relating the different levels of cognitive functionings within one age group to the moral modes of conceptualization. The present investigator found that the transition of pre-operational to operational thought functions takes place at about age 6. Of the 15 Ss in that age group, four Ss were in the pre-operational level, five Ss were in the pseudo operational level and six Ss were in the operational level of cognitive functioning within Piaget's system. When one observes the modes of moral conceptualization between the groups in Figure 14, the parallel in development is apparent.

It should be noted that the subjects in this investigation were of average intelligence or better, as defined by the WISC vocabulary test scores. The Ss were also first-born children of middle and upper middle class, and from Caucasian families. Thus the generality of these findings is limited to samples from similar populations.
Figure 14. Mean frequency of moral responses of conservers and non-conservers among six-year-olds (an illustration)
SUMMARY

The present investigation was undertaken in an attempt to test the fruitfulness of some of Piaget's hypotheses. It was designed to find out whether general cognitive structures and structures involved in moral judgment develop concomitantly.

The experimental procedures involved the testing of 195 boys, equally represented at age 5 through 17, on a series of six Piagetian cognitive tasks to determine their level of cognitive functioning. The tasks used to represent the three types of cognitive functions were: 1) negation—conservation of mass and liquid, 2) reciprocal—lateral discrimination and projected space, and 3) formal—equilibrium of the balance and shadow projection. Each boy's performance on these cognitive tasks was used to predict his level of moral judgment. Level of moral judgment was determined by his responses to nine different morally conflicting story situations. These stories were designed to measure a child's centration on authority vs. peer cooperation vs. humanitarian acts. Thus, children's cognitive and moral development (with social class, sibling position and I.Q. held constant) was hypothesized to progress sequentially, and concomitantly 1) from a beginning period of pre-operational thought where moral judgments are based mainly on an authority oriented approach, 2) to the next stage of concrete operational thought where cooperation and
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reciprocity are used as a base for moral judgment, and 3) finally to the formal operational stage of thought where judgment involves idealistic, ideological orientations.

In general, the findings of this investigation support Piaget's hypothesis of sequential stages in both cognitive and moral development. Using a hierarchical factor analytic method, three factor scores were generated defining the three orthogonal cognitive components of 1) general cognition, 2) concrete operations, and 3) formal operations. These three cognitive components were used to predict the various modes of moral conceptualization. It was found that, with age held constant, concrete operations component best related to a decrease of authority type responses and concomitant increases in reciprocity responses in moral modes of conceptualization. The formal operations mode of thought best predicts the increase of societal, idealistic moral modes of conceptualization. Further support that cognitive and moral modes of thought covary according to their respective modes of conceptualization is found in the transition functions among them as age progresses. The transition functions were found to be dissimilar within the individual modes of thought but were similar across modes of thought. It was shown that (1) the cognitive domain of negation is related to a decreasing function of authority responses, (2) the reciprocal cognitive functions are positively related to reciprocity in the moral realm, and (3) the formal operations are related to the societal mode of moral conceptualization. Thus, the findings clearly support Piaget's thesis of concomitant "growth" of the two modes of thought.
APPENDIX A

Moral Stories

Authority vs. Peer Situations

1. After Dick promised to keep a secret, Harry told Dick that he brought a rabbit to school and hid it in the classroom closet. The rabbit somehow got out of the closet and was skipping around the classroom. The teacher was very angry because no one was allowed to bring pets to school. She asked each boy and girl whether they knew whose rabbit it was and Dick's turn was coming next. Dick couldn't decide whether he should say that he did not know whose rabbit it was, so Harry won't get in trouble, or tell the teacher and break his promise to Harry.

What should Dick do? Why?

2. Tim and Jason were good friends. They were both on the school tennis team; but Tim was going to quit the team because his family was too poor to buy him tennis shoes that he needed badly. One day while Jason was playing in the park, he noticed a pair of tennis shoes sitting by the park bench. The size was just perfect for Tim. Jason could not decide whether he should pick them up and give them to Tim even though they were not his, or leave the shoes there.

What should Jason do? Why?

3. The Sheriff in town was looking for the thief who had broken into the supermarket and stolen a lot of food. He later found out that it was Mr. Melvin, his very good friend, who had stolen the food. The supermarket manager told the Sheriff that everything will be alright if he got his money back. The Sheriff thought of paying the supermarket manager for everything that Mr. Melvin had stolen and not arrest Mr. Melvin because he was such a good friend.

What should the Sheriff do? Why?

Authority vs. Altruism Situations

1. Mr. Tony was working at the counter in a grocery store. The owner of the grocery store had gone out for the day and Mr. Tony was all alone in the store. A boy came in and wanted a loaf of bread, but he did not have the money to pay for it. Mr. Tony knew that the boy's father was out of work and they didn't have enough food at home. Mr. Tony could not decide whether he should give the boy the bread
when it was not his to give, or should he let the boy and his family go hungry. Mr. Tony himself did not have the extra money to buy it for the boy, he just earns enough to pay for food for his own family.

What should Mr. Tony do? Why?

2. A woman was in great pain from a special kind of sickness. Her husband was very poor and could not borrow enough money to buy the special medicine that would make the pain stop. He told the druggist that his wife was suffering so much, and begged the druggist to sell the medicine at a cheaper price or let him pay for it later. But the druggist said no. The husband could not decide whether he should break into the store and take the medicine or let his wife suffer.

What should the husband do? Why?

3. Mr. Bill was the boss of a big company. He gave his workers the highest pay and used his money to build hospitals and help the poor in his town. One day a stranger, Mr. Jack, came to town and recognized that Mr. Bill was a man who had escaped from prison ten years ago and the police were still looking for him. Mr. Jack could not decide whether he should call the police and tell them that Mr. Bill was an escaped convict from another state, or not do anything about it, because Mr. Bill was doing a lot of good for the town.

What should Mr. Jack do? Why?

Peer vs. Altruism Situations

1. After getting his allowance, David had just enough money to pay for Charles and himself to get into the movies. But on the way to the theatre, the boys were stopped by a scout who asked them to give some money to the town's Christmas fund. The money would be used to buy food and clothes for the poor people in town during Christmas. David wanted to give the movie money but Charles kept saying, "You promised David, you promised to use that money to take me to the movies."

What should David do? Why?
2. One day while Paul was playing ball at Bob's house, Bob accidentally broke a neighbor's window. Bob was very upset, because his father had said that if he broke any more windows, his allowance would be stopped for six months, and his father would also give him a good spanking. Paul, who is a good friend of Bob's, had some money saved up to give to the poor people at Christmas time and he thought maybe he should give it to Bob instead so he could pay for the window.

What should Paul do? Why?

3. Tom, the best pitcher in his little league team, was on his way to play a game when he met John who was on his way to help at a party for crippled children. John told Tom that they needed his help at the party because two of the other helpers were sick and could not be there. Tom couldn't decide what to do. He had promised the boys that he would play ball and they were counting on him to pitch; but he also felt that he should go and help at the party.

What should Tom do? Why?
APPENDIX B

Moral Judgment Scoring Criteria

Level 1: Authority

A rule is right because it is a rule. A rule is made to be obeyed. Conformity to rules are due to fear or avoidance of punishment. One cannot lie to an adult.

Level 2: Authority-bound but awareness of reciprocity

Although awareness of reciprocal peer relations exists, there is still a tendency toward resolving conflicts either benefiting to self or adherence to authority. Rules can be broken due to personal needs.

Level 3: Reciprocity

Reciprocity involves mutual give and take and a respect for other's rights. Rules or conformity to them are based on cooperation between peers. Respect for peer's rights are more important than rules.

Level 4: Societal Order

Conformity to rules or the law is based on a need to maintain societal order not just to obey per se. Laws are viewed as having rational basis and are necessary for proper functioning of society and the protection of individual rights.

Level 5: Ideological

The ideological level is based on principles rather than rules or laws. These principles are based on universal human values. The carrying out of such principles might have derogatory effects on the individual. He values these principles above his own self interests.
APPENDIX C

CORRELATIONS OF INDIVIDUAL COGNITIVE TASKS, MORAL RESPONSES AND AGE (N = 195)

<table>
<thead>
<tr>
<th>Moral Levels</th>
<th>Authority</th>
<th>Authority-reciprocity</th>
<th>Reciprocity</th>
<th>Societal</th>
<th>Chronological Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mass Conservation</td>
<td>-681</td>
<td>-159</td>
<td>269</td>
<td>427</td>
<td>554</td>
</tr>
<tr>
<td>2. Liquid Conservation</td>
<td>-696</td>
<td>-191</td>
<td>274</td>
<td>461</td>
<td>583</td>
</tr>
<tr>
<td>3. Lateral Discrimination</td>
<td>-586</td>
<td>-250</td>
<td>267</td>
<td>530</td>
<td>720</td>
</tr>
<tr>
<td>4. Projected Space</td>
<td>-576</td>
<td>-317</td>
<td>344</td>
<td>502</td>
<td>711</td>
</tr>
<tr>
<td>5. Balance</td>
<td>-529</td>
<td>-471</td>
<td>182</td>
<td>625</td>
<td>770</td>
</tr>
<tr>
<td>6. Shadow Projection</td>
<td>-481</td>
<td>-453</td>
<td>141</td>
<td>607</td>
<td>822</td>
</tr>
</tbody>
</table>

Negation (1 & 2) | -694 | -176 | 274 | 447 | 573 |
Reciprocity (3 & 4) | -617 | -303 | 289 | 548 | 760 |
Formal (5 & 6) | -525 | -480 | 168 | 641 | 828 |
----------------- | ------ | ------ | ------ | ------ | ------ |
Age | -508 | -388 | 133 | 503 |
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