

A DEVELOPMENTAL STUDY OF LEARNING,
CONFLICT, AND EGOCENTRISM

by 6791

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STATEMENT OF THE PROBLEM

Purpose

The general purpose of this study was twofold: first, to examine the behavior of children in Hammond's lens model paradigm for studying interpersonal conflict (1965); and, second, to explore the feasibility of using this paradigm to study egocentrism in children. Although extensive research has been done by Hammond and his associates on interpersonal conflict, no work has been reported using children as subjects. Also, despite the importance Piaget and others place on the concept of egocentrism as an important element in cognitive-developmental theory; there exist only a few studies beyond Piaget's work that deal with the phenomenon.

It is part of the substantive and methodological purpose of this study to show how these apparently independent areas of study may be related to one another and examined in a unitary experiment.

Such an experiment may broaden current perspectives and possibilities for these areas of study, while demonstrating the existence of theoretical and empirical relationships between them.

Since this experiment is concerned with what up to now have been considered separate problems, an examination of each in turn seems appropriate.

Egocentrism

The concept of egocentrism was first introduced by Jean Piaget in one of his earliest works concerning language and thought in the child (Piaget, 1928). Since that time it has remained one of the central concepts in his theory of cognitive development.

Piaget (1962) defines egocentrism as:

"...the lack of decentering, of the ability to shift mental perspective, in social relationships as well as in others." (p.8, 1962)

Although followers of Piaget identify different forms of egocentrism in each of the phases of development, it is primarily considered to be a phenomenon of the preoperational stage of development (2-7 years). In this stage the child begins to deal with thought as something independent of action. His view of things emerges as something unique, and he is unable to see things from another person's perspective.

The phenomenon is best understood by watching children of this age at play. The play tends to be parallel rather than interactive. Although children are talking and playing in the same physical area, and probably involved in the same activity or with the same objects; their behaviors and verbalizations have little impact on one another. Thus, an argument for children of this age is nothing but a conflict of contrary affirmations without understanding.

The child tends to think that his thoughts are common to everyone else. As a result of this, he talks with little or no attempt to communicate. He fails to "decenter", to understand that a variety of perspectives exist beyond the one he has adopted.

It is important to distinguish between a willful disregard of other perspectives and a disregard due to an inability to consider them. Piaget suggests that the child of this age has no awareness of the existence of, or any need for the existence of other perspectives. So the child behaves, talks, and thinks according to the only perspective that exists for him; his own.

In this connection, when the egocentric child plays and talks, he is content to talk at and play near others, content to understand the world as he sees it. He adapts to an uncertain world in an idiosyncratic, but certain way, content that it is the only way.

From the above discussion, the phenomenon of egocentrism seems to have several characteristics that make it appropriate for study in Hammond's

cognitive conflict paradigm.

First, the child develops in an uncertain environment. Development consists of an interaction between certain innate properties that emerge in a specified sequence, and the existing properties of the environment. As a result of adapting to the social and physical environment around him, the child develops a certain point of view. The innate abilities, or cognitive structures of the child between the ages of 2 and 7 years, only allow him to take into account that limited perspective. So when interaction takes place between children of this age, there exists a relative disregard for the other person and his point of view, which often results in conflict, despite the cooperative atmosphere of play.

These characteristics will be discussed below in more detail; first, as they provide a basis for the relevance of cognitive conflict, and then, as they provide a common ground for relating egocentrism and conflict in a unitary experiment.

Cognitive Conflict

In order to adequately gauge the relationship between egocentrism and cognitive conflict as the latter is defined by Hammond, some background discussion is necessary.

The paradigm is a modification of Brunswik's lens model of perception and judgment. It was developed in order to study human judgment and interpersonal behavior, particularly conflict.

Cognitive conflict is defined as disagreement that arises between two or more persons working toward a mutually desired goal because of differences in the way the persons think about the problem. The model assumes three necessary conditions, two of which are stated in the above definition. These are: (1) a mutual goal; (2) cognitive differences; and, (3) equivocal (i.e. un-

certain) information.

Cognitive conflict is distinct from other types of interpersonal conflict because it arises in cooperative rather than competitive situations. Thus, cognitive conflict may occur between two persons trying to cooperate in order to reach a joint goal, while competitive conflict exists when one person's attainment of the goal automatically excludes the remaining persons from reaching the goal. Rappoport (1965) used the example of a bridge game to clarify the distinction. In this game, cognitive conflict is often experienced between the partners of one team, while competitive conflict occurs between the teams. Thus, the model attempts to maximize cooperation between or among persons involved.

A second factor, and probably the primary cause of cognitive conflict, is the existence of cognitive differences between the persons involved. These are often defined as ideological or attitudinal differences. To extend the example of the bridge game, although the partners on one team both desire to win, they may have quite different ideas of the best strategy to use.

The third condition necessary for conflict is uncertainty. Although differences may exist when there is only one apparent solution to a problem, the more equivocal the information available, the greater the likelihood that cognitive differences will exist. This condition also lends realism to the model in that the environment, especially the social environment, is often relatively unpredictable due to the random diffusion of information.

Thus, if the assumptions made above about egocentrism and those made about cognitive conflict are correct, the two seem to lend themselves to investigation in a unitary study.

Relationship between Cognitive Conflict and Egocentrism

Cognitive differences appear to be of central importance in both egocentrism and cognitive conflict. In egocentrism the main emphasis is on the fact that each child has his own point of view and is unable to understand the perspectives of others. Cognitive conflict in adults is assumed to be the result of cognitive differences between them, which may involve different perspectives on a given problem.

The limited perspective characteristic of egocentrism results from the child's cognitive development, which in turn depends upon his experience with his environment. Although the child's point of view is acquired through experience, it is limited and less flexible than that of an adult due to the developing cognitive system. Thus, the child fails to view each experience in the broader perspective apparent to a more developed adult.

The cognitive differences causing cognitive conflict are also acquired through experience. The cognitions can either be acquired through general experience (i.e. socially-induced) or through laboratory training (Rappoport, 1969). However, the extent of the flexibility and breadth of the cognitions are left unspecified in the lens model.

Therefore, the conflict paradigm and egocentrism stand in a complementary relationship to one another. The former provides a methodology which enables the specification of cognitions (i.e. operationalizes experience). While Piaget's approach suggests factors within the individual that influence the way he will respond to experience.

Thus, the lens model provides a method for studying cognition more systematically. This can be seen most immediately with respect to the problems of uncertainty.

Uncertainty, a second condition, is equally involved in both phenomena. Assuming that the environment is uncertain, that information received by the child is equivocal; egocentrism is closely related to this lack of certitude. Although it is conceivable that egocentrism would arise in situations having certain solutions, the chances for it arising increases with greater uncertainty. In the cognitive conflict paradigm, uncertainty is manipulated as an independent variable by providing a task where the certainty can be statistically determined. Again this provides a more systematic approach than has been attempted by Piaget or any of the adherents to his theory.

Finally, the cognitive conflict paradigm provides a cooperative situation. By definition, this is necessary for cognitive conflict. Piaget (1928) also states explicitly that interpersonal contact is the essential element in studying egocentrism and its relation to cognitive change. He notes that:

"...in order to understand child logic, we must therefore begin by asking in what degree children communicate their thoughts, and try to conform to that of others." (p. 205, 1928)

He points out that being confronted with the views of others produces reflection upon one's own thought.

"Argument is the backbone of verification." (p. 204, 1928)

For Piaget, the social reality is a more potent force than contact with physical reality in the development of conceptions about the world.

In the conflict paradigm, cooperation is induced by joint reward or structuring of shared goals. In addition, the paradigm includes rigorous measurement of how people adapt to each other and to the uncertain task before them. This is achieved by specifying cognitive differences in the person and studying their change.

Summary

Egocentrism and cognitive conflict can be related on the basis of three points: (1) cognitive differences; (2) uncertainty; and, (3) behavior in cooperative situations. Beyond these common points, there are unique features of each phenomenon that enhance the study of the other. Research literature on egocentrism suggests what forms the behavior of children in the conflict situation might take. The methodology of the lens model paradigm allows for: (1) the specification of cognitive differences (i.e. different points of view); (2) study of these cognitions irrespective of language; and, (3) the study of adaptation to a cognitive task and to a cooperative situation.

Thus, the cognitive conflict model provides a new methodology for the study of a significant theoretical concept; and, cognitive developmental theory provides one interpretation of how children should behave in the conflict situation.

BACKGROUND AND THEORY

In reviewing prior research relevant to the present study, discussion again proceeds from egocentrism, to cognitive conflict, to the relationships indicated between them.

Egocentrism

Overall, research on egocentrism has been quite limited. The bulk of the work has come from Piaget and his associates with only a few American studies conducted. Many of the findings made concerning cognitive functioning in children of preoperational age (2-7 years) reflect egocentrism as a dominant influence. Two general approaches that focus upon different aspects of Piaget's definition of egocentrism best illustrate the nature of the findings.

The first approach, concerned with centering or deceptive perception of cues, is best illustrated by most of Piaget's work on conservation. The classic study deals with conservation of volume (Piaget and Inhelder, 1941). When asked to judge which of two containers has the greater volume, one tall and narrow, the other short and wide, the child between the age of 2 and 7 years of age tends to choose the tall one. Piaget attributes this to a centering on one of the cues necessary to judge volume; in this case the height of the container.

Another approach taken by Piaget and his associates is the investigation of the child's difficulty in discriminating between various perspectives. The child is shown a model of several mountains and tested for his ability to represent the appearance of the mountains from positions other than his own. Other studies similar to the one above, utilized different objects such as needles or discs. In these studies the child is asked to predict the various shapes the shadows of these objects would assume.

In all of the perspective studies, children between 2 and 7 years show a

marked inability to represent any but their own perspective. This was so even when the child was allowed to move to other positions. (Piaget and Inhelder, 1956)

The most consistent finding in all this work is that the nature of these judgments, both on conservation tasks and on perspective tasks, changes in a developmental sequence (i.e. there are certain behaviors associated with certain ages). Children beyond 7 years old are able to make the judgments more correctly (i.e. more in accord with adult behaviors). This, Piaget contends is the result of the onset of concrete operations which resolves the preoperational egocentrism.

Another investigator, Vygotsky (1962), has had an equally great impact on the study of one aspect of egocentrism, egocentric speech. In interpreting his own findings concerning the relationship between thought and language in the child, Vygotsky (1962) criticized Piaget's interpretations of the functions egocentric speech serves in development.

For Vygotsky, there is a communicative intent behind the child's egocentric speech. The failure of egocentric speech to communicate is not a function of the child's lack of intent or ability to communicate socially, as Piaget contended. Instead, it is a result of the lack of differentiation between communicating to the self and to another.

Piaget contended that the lack of communication in children's speech was due to an inability, a cognitive inability, to differentiate between different perspectives. For Vygotsky, however, the failure was due to the difference in function between egocentric and social speech.

In a reply to Vygotsky's criticism, Piaget (1962) notes that the essential distinction between him and Vygotsky is that while he emphasizes the cognitive functioning aspects of egocentrism, Vygotsky emphasizes the function of ego-

centric speech. Piaget added that the objections raised by Vygotsky were more a result of misunderstanding than actual difference.

Research undertaken beyond the early work of the 1930's has either sought to replicate Piaget's work, or test some of the implications of the concepts emanating from it. In general, this research has supported Piaget's general theory of cognitive development and, in particular, his notions of egocentrism. For reviews of much of the replication work see Sigel & Hooper (1968).

To a limited extent, other research has been undertaken that attempts to extend Piaget's findings on egocentrism either methodologically or to broaden their generality.

Laurendeau and Pinard (1962) conducted an extensive study of the "precausal thinking" of the child that was derived from Piaget's work. Their work essentially supported Piaget. They found:

"...the development of the child's causal thinking consists in a progressive substitution of physicalistic interpretations for primitive beliefs. This substitution takes place as the child progresses from initial egocentrism toward adult objectivity, that is, as he gradually succeeds in dissociating his own self from the external universe."
(p. 260, 1962)

In another set of studies, Feffer and his associates have utilized measures implied by Piaget's research. (Feffer, 1959; Feffer and Gourevitch, 1960). Feffer developed a role-taking task (RTT) derived from Piaget's notions of decentering and viewing the world from another's perspective. Feffer and Gourevitch (1960) used the RTT to investigate role-taking developmentally. The task consisted of the subject first describing two different scenes containing several persons. Then, the subject was asked to describe the scene from the perspectives of each of the persons initially included in the stories. The degree to which they could maintain the proper perspective for each of the

persons was the measure of decentering or lack of egocentrism.

It was found that the ability to decenter in the RTT increased with age, as was predicted from Piaget's definition of egocentrism. Feffer also found correspondence between the degree of decentering on the RTT and performance on Piagetian tasks.

Scarlett, Press, and Crockett (1971) studied the development of interpersonal perception of boys in grades one, three, and five. They examined the quality and quantity of constructs used by the different aged children to describe other children. Consistent with Piagetian notions, they found that the number of constructs used increased with age, accompanied by a shift from egocentric and concrete constructs to nonegocentric and abstract constructs. This study exemplifies an approach used to extend Piagetian cognitive developmental theory, and broaden the generality of the theory.

An interesting innovation based on Piagetian theory has been developed with respect to adolescents (Elkind, 1967). Central to Piaget's developmental theory is the contention that development in each stage proceeds from a stage of disequilibrium or egocentrism, to a state of equilibrium. The nature of the egocentrism varies as a function of the stage (e.g. preoperational egocentrism consists of the child's inability to decenter and take into account more than his own perspective.). Elkind (1967) discussed egocentrism in the formal operational stage. Formal operations emerging at about the age of puberty, enable the person to construct all the possibilities in a system, construct contrary-to-fact propositions (Inhelder and Piaget, 1958); and enable him to conceptualize his own thought and the thought of others (Elkind, 1967). The egocentrism of this stage involves the person's new ability to conceptualize his thoughts and that of others. It consists of the belief that others are preoccupied with his appearance and behavior (Elkind, 1967). Adolescent

egocentrism is finally overcome at around the age of 15 or 16, at which time the adolescent becomes able to fully differentiate his own preoccupations and thoughts about himself from those of others.

It should be pointed out that Piaget differs from Elkind in the exact substance of the adolescent egocentrism, though agreeing with the fact of its existence. Piaget contends that rather than a preoccupation with himself, the adolescent is preoccupied with the ideal. The ability to conceptualize all possibilities and consider new ones leads the child to emphasize the ideal, neglecting the actual state of things. This subsides at about age 15 or 16 as the adolescent integrates and assimilates his experiences with reality to his notions of the ideal.

Elkind's research emphasizes Piaget's notion that egocentrism is a central process throughout cognitive development, and that the exact nature of it varies with the specific developmental stage. Although it differs from Piaget, it is supportive of developmental theory in its emphasis on changes that occur in reasoning with age. The differences point up the fact that some of Piaget's theory remains controversial, and more research is necessary to test the many implications emanating from it.

In summary, research on egocentrism, though limited, has generally supported Piaget's findings. This holds for replications of his work using his techniques (see Sigel & Hooper, 1970); as well as work stimulated by implications from his theory (Feffer & Gourevitch, 1960; Scarlett, Press, & Crockett, 1971; Elkind, 1967).

The findings emphasize that: (1) cognitive functioning does develop through a given sequence; (2) each stage is characterized by egocentrism particular to the abilities of that stage; and, (3) egocentrism of the pre-operational stage is characterized by the child's inability to decenter, to

take into account another's point of view. Finally, the most recent research directed at testing implications of Piaget's theory illustrates that such research is feasible and is supportive of cognitive developmental theory.

Cognitive Conflict

As discussed in the first chapter, cognitive conflict is interpersonal conflict that occurs when two or more persons working toward a common goal think differently about how best to achieve that goal. Since 1963, extensive research has been done that illustrates the validity and utility of the model for studying conflict due to cognitive differences.

The most central finding of all the work done with the lens model is that the characteristics of the model are operationalized successfully. Therefore, a description of the model is essential to a full understanding of its appropriateness.

Laboratory Model of Cognitive Conflict

The research by Hammond and his associates on cognitive conflict is derived from Brunswik's probabilistic functionalism and his "lens model" of behavior (Brunswik, 1952; 1956). A review by Hammond, Hursch, and Todd (1964), provides a description of the general characteristics of the lens model and its potential for the study of cognition. For examples of its application to the study of interpersonal conflict see Rappoport (1965; 1969), and Todd, Hammond, and Wilkins (1966). The technical basis for the analysis of data generated by the lens model is discussed in Hursch, Hammond, and Hursch (1964), Hammond, Hursch, and Todd (1964), Hammond and Summers (1965), Summers and Hammond (1966), Peterson, Hammond, and Summers (1965; 1966), Hammond and Brehmer (1970).

Brunswik's lens model, as it has been modified for the purpose of studying interpersonal cognitive conflict, is diagrammed in Figure 1. Note that the

generation of cognitive conflict between subjects is a two stage process consisting of a training stage and a conflict stage.

Training Stage

Individual subjects practice on different versions of a multiple-cue probability task. Each version differs because of a different set of cue-validities. The subjects learn to base their judgments of a distal or criterion variable on different cues.

For example (see Fig. 1), one subject practices on a version of the task where cue #1 has the highest cue-validity. As a result of practice, he learns to weight cue #1 the most when making the judgment of the distal value. That is, he learns that the value of the distal variable is highly correlated with the value of cue #1. Another subject practices on a second version of the task where cue #3 has the highest cue-validity. This subject learns to weight cue #3 the most when making the judgment of the distal variable.

As a result of the training, subjects think differently about the judgment task.

Conflict Stage

Following training on the multiple-cue probability task, subjects with different cue dependencies are brought together on a third version of the same task. This version differs from the first two because it contains a new set of cue-validities. For example, if the subjects were trained to weight cues #1 and #3, then in this stage cue #2 would have the greatest validity.

The subjects are asked to come to a joint agreement and make a joint judgment of the distal criterion variable. The procedure is as follows:

- 1) Each subject makes a judgment of the distal variable privately.
- 2) The subjects, together, must make a joint judgment of the distal variable.

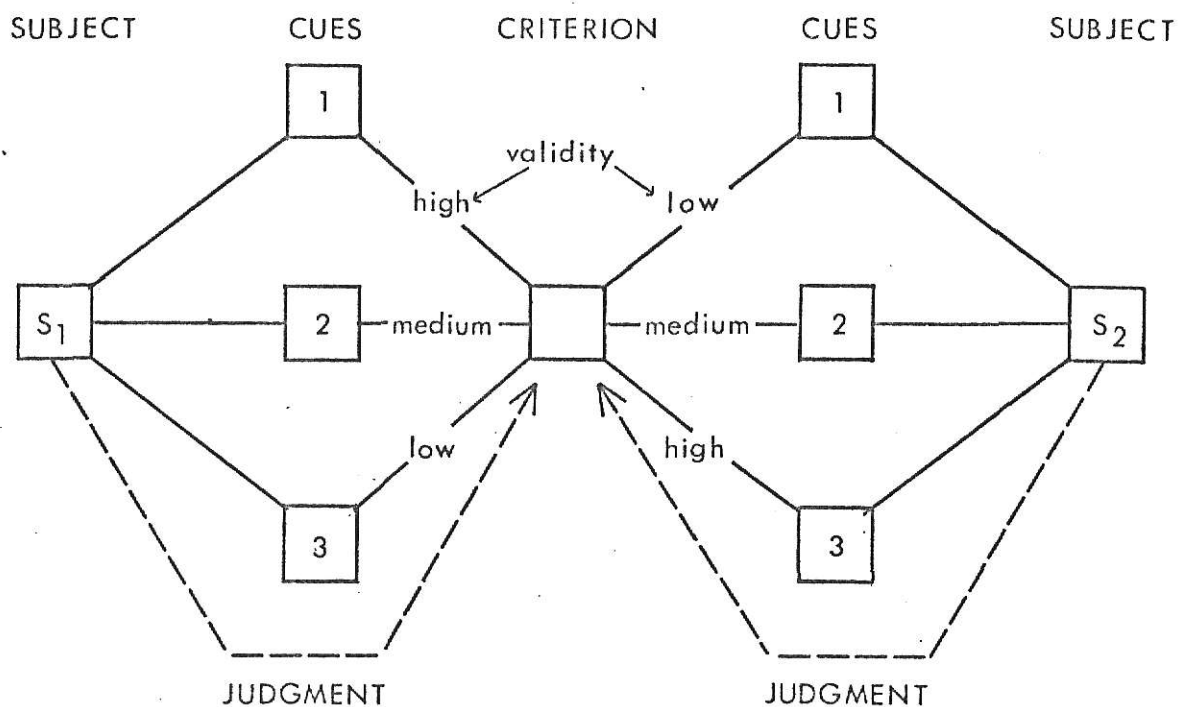
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Fig. 1. Diagram of the two-stage lens model paradigm for the study of two-person cognitive conflict.

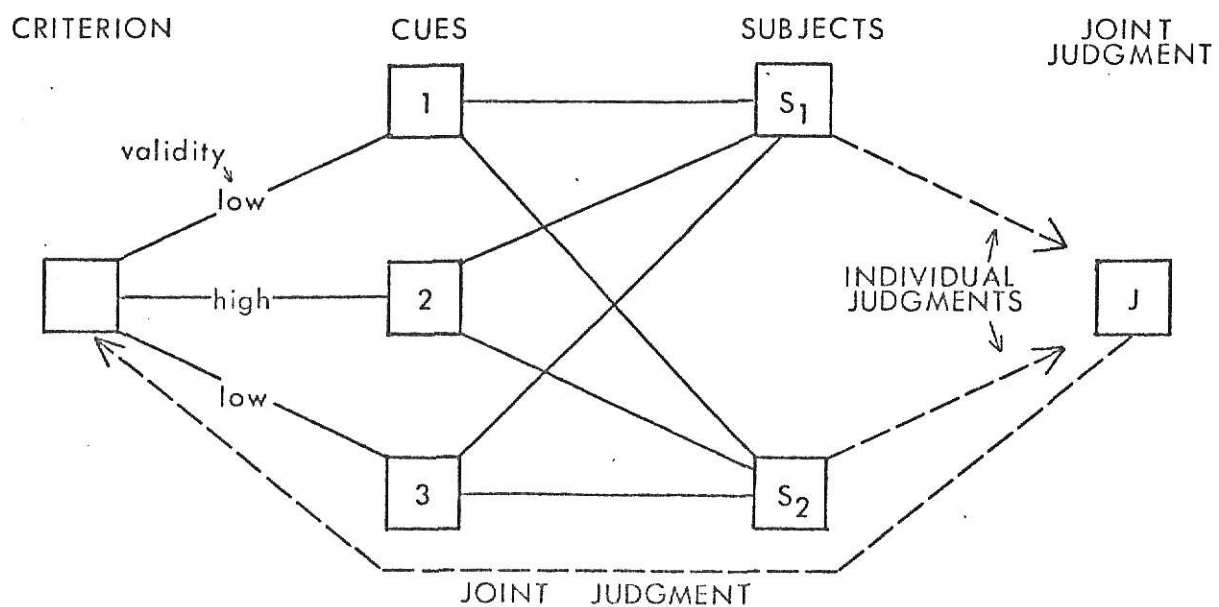
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STAGE I: TRAINING TASKS



STAGE II: CONFLICT TASK



- 3) Each subject makes a second judgment of the distal variable privately.

The conflict emerges from the discrepancy between the judgments of the two subjects and is worked out in their attempt to arrive at a single joint judgment of the distal variable.

The three conditions necessary for cognitive conflict are all satisfied in this paradigm in the following ways. The multiple-cue probability training creates individual differences in the way subjects think about the problem. Each subject comes to the conflict stage with a different "idea" (cue-weighting) of how to arrive at the correct judgments.

Uncertainty is built into the task by specifying the correlations between the cues and the criterion so that the multiple correlation equals less than unity. This provides the necessary ambiguity enabling discrepant cue weights to exist.

The mutual fate is established through instructions and feedback relative to their joint judgments. The subjects must come to a joint decision in order to receive feedback on their performances. In this way the demand is present for cooperation rather than competition.

Research on Cognitive Conflict

A sizeable body of literature has emerged since the first studies utilizing the lens model were completed in 1963. For a complete review of that research, see Hammond (1970) and Hammond and Boyle (1970).

In general, it has been demonstrated that: (1) cognitive differences can be created in subjects (i.e. subjects do learn cue dependencies on a multiple-cue probability task.) (Peterson, Hammond, & Summers, 1965); (2) these cognitive differences generate conflict between subjects (Rappoport, 1965); (3) the conflict diminishes to a certain extent over trials, but never

completely disappears (Hammond & Boyle, 1970); (4) the results are valid cross-culturally (Hammond & Boyle, 1970); and, (5) the paradigm can be used to sample real-life policies (i.e. cue-weights) related to pertinent issues (Rappoport, 1969; Rappoport, Pettinelli, & Summers, 1970).

The research to date has been done exclusively with adult subjects. Therefore, it is appropriate that children be utilized as subjects to investigate the possibility of extending the generality of the model, while studying the cognitive functioning and behavior of the children in this situation. A more explicit rationale for studying both egocentrism and cognitive conflict in a unitary fashion is given in the following section.

Egocentrism and Cognitive Conflict

As discussed above, there is a respectable amount of empirical support for Piaget's notion of egocentrism and for the appropriateness of the cognitive conflict model for studying cognitive differences in persons. But, while the discussion in the first chapter attempted to demonstrate a relationship between the two phenomena at the conceptual level, there was no mention of empirical research directed toward the problem of studying these two phenomena in a unitary study. Although there is little explicit research and discussion of this problem, there have been several papers that have compared Brunswik and Piaget; as well as research that lends support to the use of the concept of egocentrism to explain performance on probability learning tasks.

Smedslund (1966) has discussed the relationship between Brunswik and Piaget. His analysis was at the theoretical level and tended to emphasize the general differences. Probably his most important point for the present study is his evaluating Brunswik's contribution as methodological and Piaget's as theoretical. This implies a marriage of the two in accord with the aims of this study.

Brunswik (1959) directly acknowledged the relevance and accuracy of Piaget's findings, particularly with respect to the role of the concept of egocentrism in the development of concepts of physical reality. But while thus acknowledging Piaget, Brunswik did not pursue comparison of Piaget's theory with his own.

The strongest empirical indication of the relevance of the present study is the work that has been carried out on probability learning in children.

Probability learning in children

Research on this problem has been quite extensive. Since probability learning is the central task in the lens model paradigm, it is important to consider children's capacity for such learning.

Kessen and Kessen (1965) have demonstrated probability learning in children as young as 3 years 7 months. Crandall, Solomon, and Kellaway (1961) have also found that children 6, 7, and 8 years old are quite able to achieve on a probability learning task. All these findings indicate that children as young as 3 years are able to maximize on a probability learning task.

The next question concerns how learning differs for different aged children. Weir (1964) used a task which involved partial reinforcement for response on one of three manipulandum with the remaining two "dead". He found that subjects 3 and 5 years of age used a simple approach and tended to use a pure strategy in learning the task. Older subjects (18 years old) used more complex strategies. Overall, children maximized their acquisition of rewards while the adults matched probabilities. Weir concluded that the performance of the 3-5 year old subjects is a result of a different process than that for the 18 year old subjects. This suggests developmental differences in the way the children perform on a probability task, with the younger children (under 7) centering on the concrete aspect of the task (i.e. the reward), and the older children

decentering and approaching the task in a more abstract fashion.

Kendler and Kendler (1962) have also found developmental differences in the performance of children and adults on a concept learning task. In their paper they discuss a series of studies utilizing what they term reversal and nonreversal shift concept learning problems. The nonreversal shift, which could be considered similar to the multiple-cue task, consists of learning a discrimination based on one dimension (e.g. color: black-white), and then learning to respond to a second dimension (e.g. size: large-small). The reversal shift problem consists of learning a discrimination on one dimension (e.g. color, where black is correct) then shifting to the opposite response on the same dimension (white). The findings indicate definite differences in performance with age.

Kendler, Kendler, and Wells (1960) found that nursery school children were able to execute nonreversal shifts faster than reversal shifts. Kendler and Kendler (1959) reported that kindergarten children performed both tasks at the same rate, with fast learners executing the reversal faster and slow learners executing the nonreversal more quickly. Finally, Buss (1953) found that college students executed the reversal shift faster than the nonreversal shift.

Kendler and Kendler (1962) point out that because of different experimental procedures it is difficult to draw definite conclusions. This holds also with respect to comparing these studies to the present investigation. Despite the apparent similarity between the nonreversal shift and the multiple-cue task, it is difficult to conclude performance will be the same on both. It is therefore difficult to predict from their results anything relevant to the present study except that children perform differentially according to their age.

Thus, research findings indicate that children as young as 3 years old are able to achieve on a probability task; and that there are developmental

differences in performance.

Rationale for Present Research

The objective of the first two chapters was to demonstrate; (1) that at the conceptual level, egocentrism and cognitive conflict, as represented in the lens model, are related; (2) there is a respectable body of empirical research in support of each phenomena; and, (3) while no research has been done directly studying the two phenomena jointly, some authors imply such research would be appropriate.

The present study is designed to explore questions that emerge from considerations concerning the relationship that seems to exist between the two phenomena. It is important to reemphasize that the inferred relationship between these two phenomena is based on several assumptions both implicit and explicit in cognitive-developmental theory.

The main assumption concerns the nature of egocentrism. That assumption is that egocentrism is an inability to decenter; a judgmental inability due primarily to the nature of the child's cognitive system at that point in development. The emphasis in the present study is on the fact that this inability takes on different overt forms depending on the nature of the child's experience. Consequently, children will vary a great deal in their cognitive abilities (i.e. have different conceptions of the same problem due to discrepant experiences, and be unable to take any others into account). Furthermore, this inability only passes with time relative to experience and the normal development of the child. Therefore, if it is possible to specify discrepant cognitions in children of preoperational age, such differences should hinder cooperative problem-solving efforts.

The next assumption concerns the role of the lens model as an appropriate means for studying egocentrism. The lens model represents a paradigm where

cognitions can be specified so as to create cognitive differences in children. This paradigm also provides a variety of measures that should serve to indicate the effect of cognitive differences on interaction in a cooperative task.

There are several measures available in the lens model that indicate the effects of interaction on cognition and vice versa. Since the questions explored in this study are relative to these measures, a description is necessary. These measures include the following: (1) the subject's cue-weightings (i.e. the degree to which the subject uses the cues as predictors as measured by correlations between the cue values and the distal values.); (2) individual achievement correlation (i.e. the correlation between the subject's responses on the distal variable and the correct distal values); (3) overt conflict (i.e. the discrepancy between the first judgments of each subject in each pair in the conflict stage); (4) covert conflict (i.e. the discrepancy between the second judgments of each subject in the conflict stage); (5) joint achievement correlation (i.e. the correlation between the joint judgment made by the pair in the conflict stage and the distal values); and, (6) cognitive change (i.e. the difference between the subject's first and second judgments on a single trial in the conflict stage).

Research has indicated that; (1) the subject's cue-weights approach the objective cue-weights of the task after training; (2) the individual achievement correlation approaches the maximum value possible for a given task (1.00); (3) overt conflict and covert conflict are initially very high in the conflict stage but discipate over trials; (4) the joint achievement correlation reaches significance over trials; and, (5) there is a reduction in cognitive change over trials as a result of adaptation to the task.

The existence of egocentrism as a central concept in considerations of cognitive functioning suggests certain types of performance in the conflict

situation;

- (1) children, aged 6 years, will not show as significant a shift in cue-weights from initial training as children aged 12 years;
- (2) children, aged 6 years, will demonstrate poorer individual achievement correlations in the conflict stage than the 12 year old children;
- (3) children, aged 6 years, will show little or no reduction in overt and covert conflict over trials;
- (4) children, aged 6 years, will show a lower joint achievement correlation than the older children;
- (5) children, aged 6 years, will show less cognitive change than the 12 year old children.

Therefore, two main questions are being explored:

- (1) Are children 6 years old able to initially learn on a multiple-cue task? (Since this training establishes the cognitive differences central to the model, this question is critical to the remainder of the study.) ?
- (2) Is the lens model a viable paradigm for studying children, especially with respect to egocentrism?

METHOD

The general aims of this study, to investigate the behavior of children in an ambiguous judgment situation, and to determine to what degree preoperational egocentrism is characteristic of their behavior, were carried out by utilizing a multiple-cue judgment task.

The Task

The task consists of three cues or proximal variables which are probabilistically related to a criterion or distal judgment variable. The subjects must determine the correct distal judgment based on information provided by the three cues. Only one of the three cues is significantly related to the distal variable, and all three cues are unrelated to one another. Finally, in order to maintain a condition of uncertainty, the multiple correlation between the cues and the criterion is less than 1.00 ($R^2 = .91$).

The cue-criterion configuration was unique to the present study. Because of the age of the subjects the task could not include verbal or numerical material requiring corresponding skills in the children. A special perceptual matching task was devised that was non-verbal, non-numerical, and only required that the subjects be able to point at the judgment values they selected.

Subjects were required to judge the height of a silhouette on the basis of the size of three cues on a face: (1) the eyes; (2) the nose; and, (3) the mouth (see Fig. 2). Each cue had five possible sizes. The faces were drawn on 4" x 6" index cards and contained on 8" x 11" plastic insert pages which were contained in a loose-leaf binder. On each face the sizes of the eyes, nose, and mouth varied according to their respective correlation with the distal variable.

The possible distal judgments were displayed on 4" x 6" index cards on the reverse side of the pages containing the face. The criterion had seven

possible values (see Fig. 2).

Subjects

Seventeen male and female first grade students (\bar{x} age: 6:9 years), twenty male and female sixth grade students (\bar{x} age: 11:11 years), and ten male and female college freshmen were used as subjects. The ages were selected to correspond to Piaget's stages of cognitive development. The first grade subjects fall within Piaget's preoperational stage where egocentrism is considered to be quite strong. The sixth grade subjects correspond to Piaget's formal operational stage where egocentrism is at a minimum or nonexistent. College freshmen were used for a comparison with adult performance.

Procedure

The lens model paradigm involves a two stage procedure: (1) training stage; and, (2) conflict stage.

Training stage

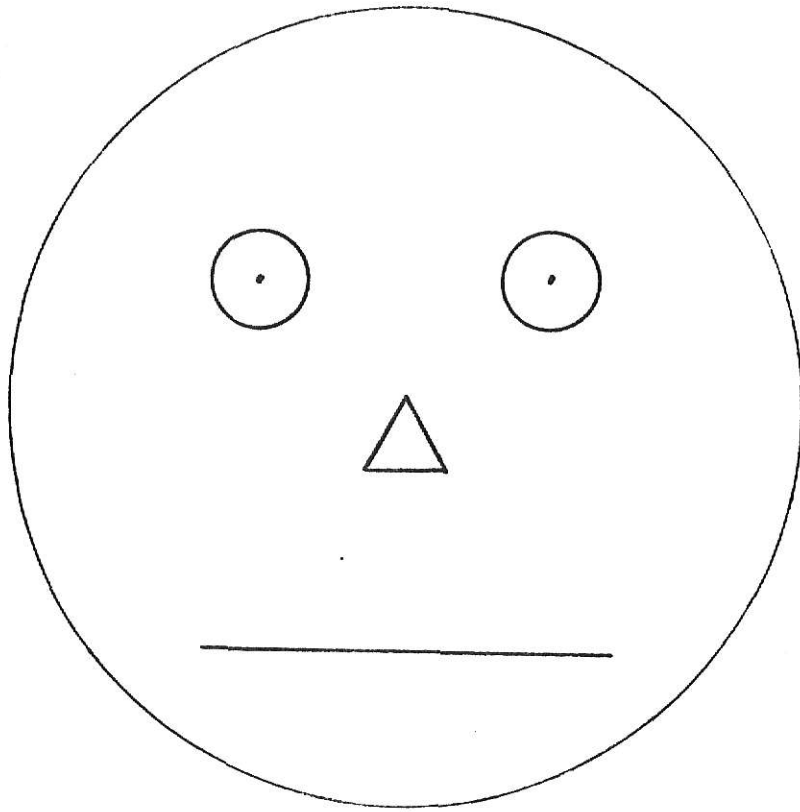
In this stage all forty-seven subjects were trained individually on the multiple-cue judgment task for sixty trials.

Each subject received the same instructions (see Appendix A). The subjects were instructed to "guess" which face should go with one of the seven available silhouettes. Emphasis was placed on the task being a guessing game. The S was then told that after each guess he would see a duplicate set of silhouettes with the correct one filled in with red.

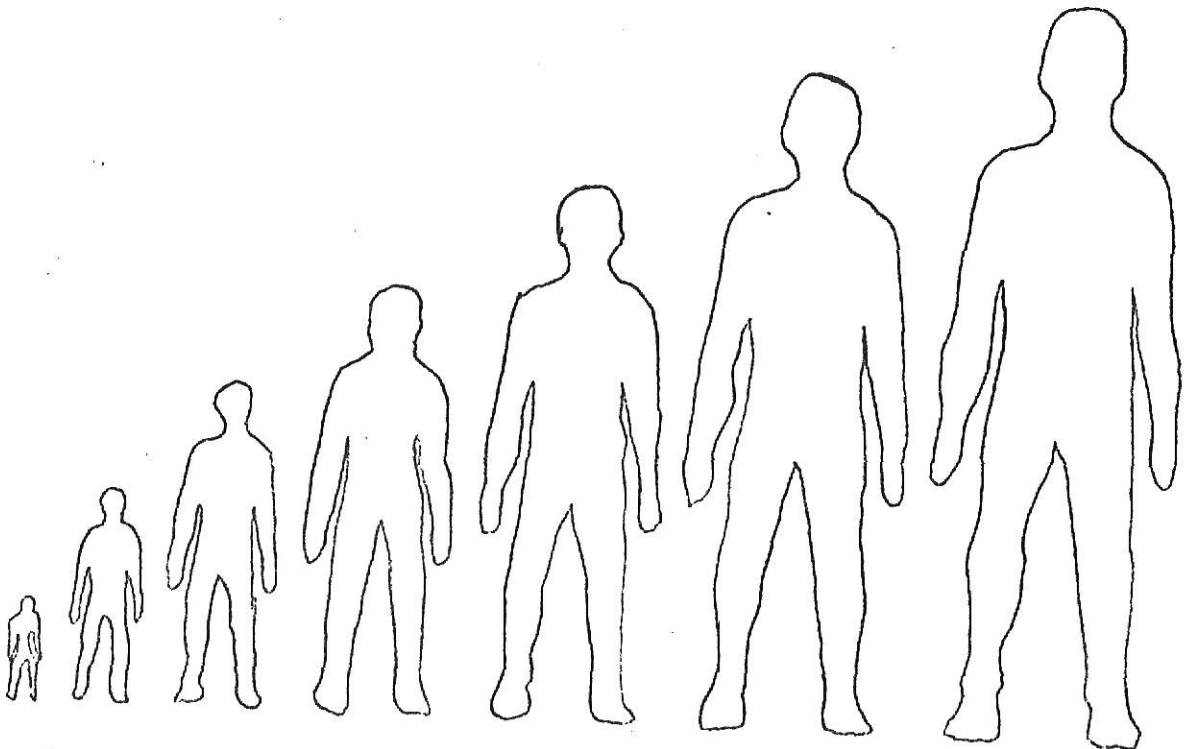
The subject was then presented the cues (faces) individually. On each trial, he was required to judge (match) which silhouette the face would correspond to, given the size of the eyes, nose, and mouth. Upon selecting a silhouette, the subject was shown the correct silhouette on the reverse side of the page. The procedure was then repeated for each of sixty trials.

Figure Caption

Fig. 2. Example of facial cue configuration and silhouette criterion variable.



CUE CONFIGURATION



CRITERION

Subjects in each age group were divided into two sub-groups. One sub-group was trained having the mouth as the significantly related cue with the eyes and nose not significantly related (mouth group). The second sub-group was trained having the nose the significantly related cue (nose group). The differential training is critical in that it provides the cognitive differences discussed in the introductory chapters.

Cue-weights in training

Nine first grade subjects, eleven sixth grade subjects, and five college subjects were trained with the nose as the significantly related cue ($r = .96$). Eight first grade subjects, ten sixth grade subjects, and five college subjects were trained with the mouth as the significantly related cue ($r = .96$). The remaining two cues were not significantly related to the criterion ($r = -.06$ and $r = .19$). The multiple correlation coefficient for all three cues with the criterion was $r^2 = .91$, indicating the task was partially indeterminate.

Conflict Stage

Pair selection

Performance on the training task was measured initially by deviations in subject's judgments from the correct values of the criterion. These deviation scores were then summed for the last ten-trial block. Subjects were then rank-ordered according to the sum of the deviation scores in their respective training group (nose or mouth).

Pairs were selected by matching subjects from the different training groups according to their rank. Thus, the subject that ranked highest (having fewest errors) in the first grade "nose" group was paired with the subject ranked first in the first grade "mouth" group.

Initially, five pairs of first grade subjects and six pairs of sixth grade subjects were selected. Since performance in the conflict stage is initially

a function of training, only the subjects exhibiting the best performance in training were used.

Conflict task

Pairs were brought together and told that the object of the task was to see how well they could work together on the task they had worked on individually; to see if "two heads were better than one." They were presented; (1) individual forms for recording judgments in the form of a booklet containing seven silhouettes on each page; (2) a set of stimulus cards in a loose-leaf binder; and, (3) a set of instructions read by E (see Appendix B).

Subjects were to first observe the cues (faces) for a given trial. They were reminded that this was exactly what they had done while being tested individually. Then, without discussing what they saw or their judgment, each S was to record his individual judgment by checking one of the silhouettes on the appropriate page of his personal booklet. After their judgments had been recorded, the two subjects were permitted to discuss their personal judgments for the trial as well as differences between the judgments and why they occurred. It was emphasized that they should explain to their partner why they made a specific judgment. Following the discussion, they were to agree on one judgment and inform E of their joint judgment. Finally, each subject was to make a second individual judgment and record it in his booklet privately. Similar to the first private judgment, subjects were not permitted to discuss their second judgment.

Following the sequence of judgments for one trial, the subjects were shown the correct answer. At this time they were awarded one cookie each if their joint judgment was perfectly accurate. This was done to increase motivation and interest.

In summary, subjects observed the following procedure for each trial;

- (1) observed the cues
- (2) made and recorded an individual judgment of the criterion privately
- (3) discussed their judgments and any differences that may have occurred
- (4) agreed on a joint judgment of the correct criterion value
- (5) reported the joint judgment to E
- (6) made and recorded a second individual judgment of the criterion privately
- (7) received the correct answer
- (8) received a reward if the joint judgment was correct

The cue-criterion correlation coefficients were the same for this stage as for the training stage. The difference was that the size of the eyes was the significantly related cue ($r = .96$), and the nose ($r = -.06$) and the mouth ($r = .19$) were both zero-order. Thus, the subjects were required to adapt to new cue validities in order to achieve in this stage.

Design Summary

The study utilized a two-stage paradigm consisting of: (1) a training stage; and, (2) a conflict stage.

In the training stage, three age levels, two training procedures, and six ten-trial blocks defined a $3 \times 2 \times 6$ repeated measures design. The dependent variables for this stage include: (1) achievement correlations; and, (2) subject's cue-weights.

By analyzing the subjects behavior here, it should be possible to determine: (1) whether there are age-related differences in their ability to make accurate judgments on a multiple-cue task, as reflected by achievement correlations and cue-weights; and, (2) whether age-related differences in learning indicate egocentrism.

In the conflict stage, two age levels, two training procedures, and three ten-trial blocks defined a $2 \times 2 \times 3$ repeated measures design. The dependent

variables here include: (1) individual achievement correlations; (2) subject's cue-weights; (3) joint achievement correlations; (4) overt conflict; (5) covert conflict; and, (6) cognitive change.

An analysis of children's behavior here should help to determine:

- (1) if having adapted to a given set of objective cue-validities, they are able to adapt to a second set. Or, more specifically, does the egocentrism of younger children interfere with their ability to adapt to the conflict task;
- (2) whether or not children having discrepant ideas relative to a given problem can agree on one common judgment (as reflected by measures of overt and covert conflict);
- (3) if children with different ideas about the task can agree on joint judgments, and if so, are they accurate;
- (4) to what degree a child's judgment is modified by discussion and joint decision-making with another child (as reflected in the degree of cognitive change).

Each of the above measures utilized in the conflict stage will indicate whether egocentrism is an influence on the behavior of the children in the following ways: (1) if children have difficulty adapting to the second set of validities present in the conflict stage; (2) if children exhibit an excessive amount of conflict that fails to diminish over trials; (3) if children fail to show any cognitive change as a result of experience making joint judgments; and, (4) if children fail to show any joint achievement.

In general, results relevant to the issues listed above should indicate if the lens model paradigm is appropriate for studying the behavior of children and how it is effected by different cognitions, as well as if it is an appropriate paradigm to use in the study of egocentrism.

RESULTS

Training

Training effectiveness was evaluated in terms of the subject's achievement or accuracy, and according to how they utilized the cues. These two measures are related in that the achievement correlation measures the correspondence between the subject's judgments and the actual values of the criterion; while the cue weight is a measure of the degree to which the subject relied upon a given cue in making the judgments. In order for a subject to be accurate, it is necessary that he rely upon the cue that is the significant predictor of the criterion.

Achievement

Overall, subjects shows significant learning as indicated by the mean achievement correlation obtained for all subjects on their last thirty training trials ($r = .41$, $p < .05$).

Further analyses were done to determine if there were differences in the level of achievement attained by the respective age groups.

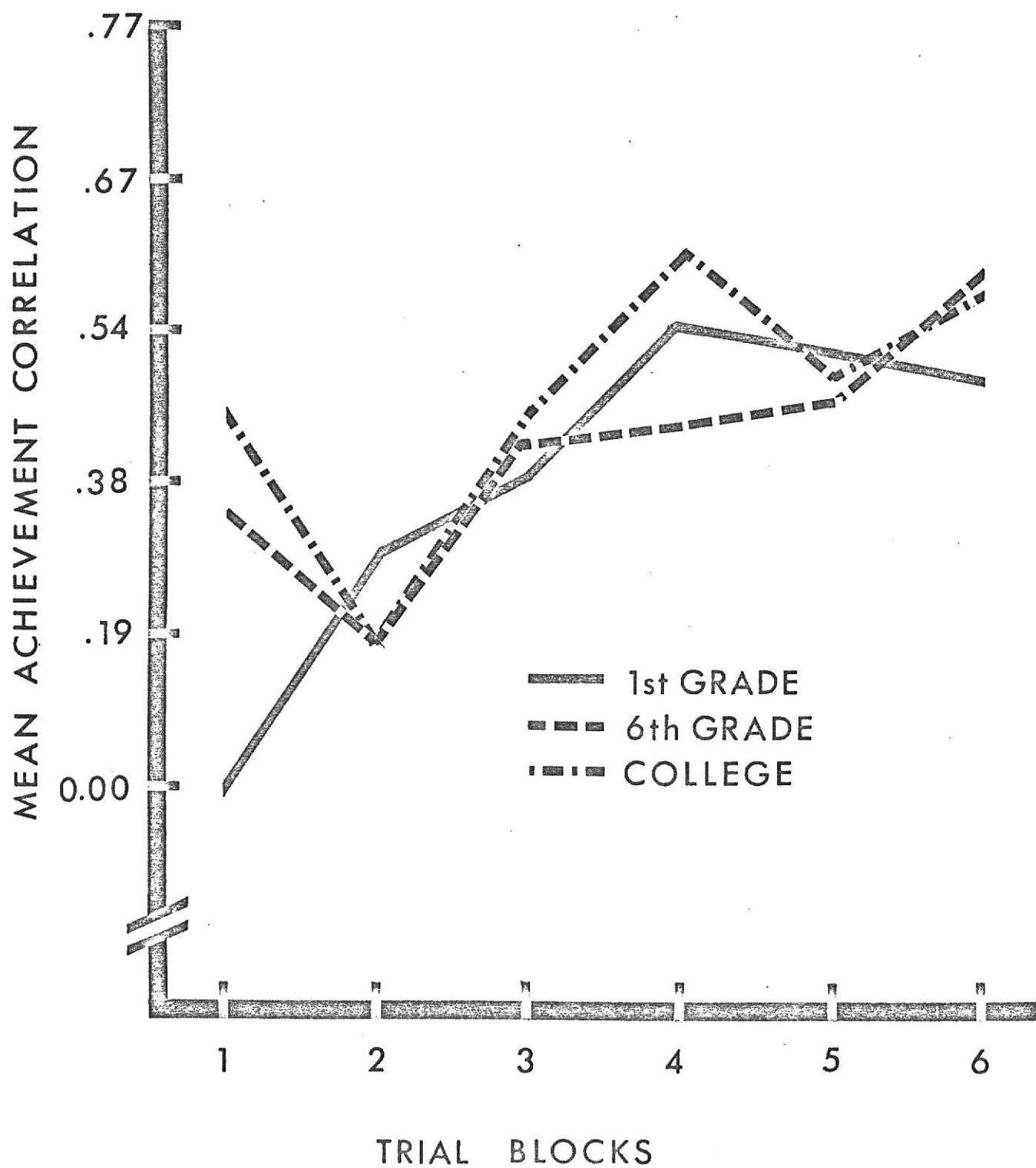
As can be seen in Figure 3, achievement improved significantly across trials for all subjects. In addition, there appears to be no difference in achievement between age levels indicated in Figure 3. Finally, as seen in Figure 4, subjects trained in the task where the mouth was the significantly related cue performed reliably better than the nose-trained subjects.

The 3x2x6 repeated measures analysis of variance applied to the mean achievement correlations across six ten-trial blocks is summarized in Table 1. As indicated in Table 1, all the above-mentioned results are significant at better than the .05 level.

A summary of the mean achievement correlations for each age level under each training condition is contained in Table 2. It clearly indicates better

Figure Caption

Fig. 3. Mean achievement correlations for 1st grade, 6th grade, and college subjects in training.



achievement for those Ss trained in the condition where the mouth was the significantly related cue.

A separate analysis was made of the training achievement scores of the subjects selected for further testing in the conflict stage. Overall, these subjects demonstrated higher mean achievement than the entire group of subjects trained ($r = .50$, $p < .005$).

As seen in Figures 5 and 6, subjects selected for the conflict stage showed significant improvement in achievement across trials. In addition, Figure 5 indicates that the first grade mouth-trained subjects showed better achievement than the sixth grade subjects and Figure 6 shows that sixth grade nose-trained subjects had better achievement than first grade subjects.

An analysis of variance applied to these scores is summarized in Table 3. It indicates that both the main effect for trials ($F(5,90) = 7.23$, $p < .005$), and the age x cue interaction ($F(1,18) = 5.07$, $p < .05$) are reliably significant.

The age x cue interaction is also evident in Table 4, a summary of the mean group achievement correlations for the different cue conditions. It clearly shows the interaction to be the result of the first grade mouth-trained subjects and the sixth grade nose-trained subjects showing better achievement than the first grade nose-trained subjects.

Cue Weights

Use of cues is measured by computing a correlation between the subject's judgments and the values on each cue variable.

As can be seen in Figures 7 and 8, the cue values indicate subjects did learn. They tended to increase their dependence on the relevant training cue for their respective group, while dependencies for the two unrelated cues either decreased or remained the same. This supports the significant achievement

Figure Caption

Fig. 4. Mean achievement correlations for all subjects by respective training cue.

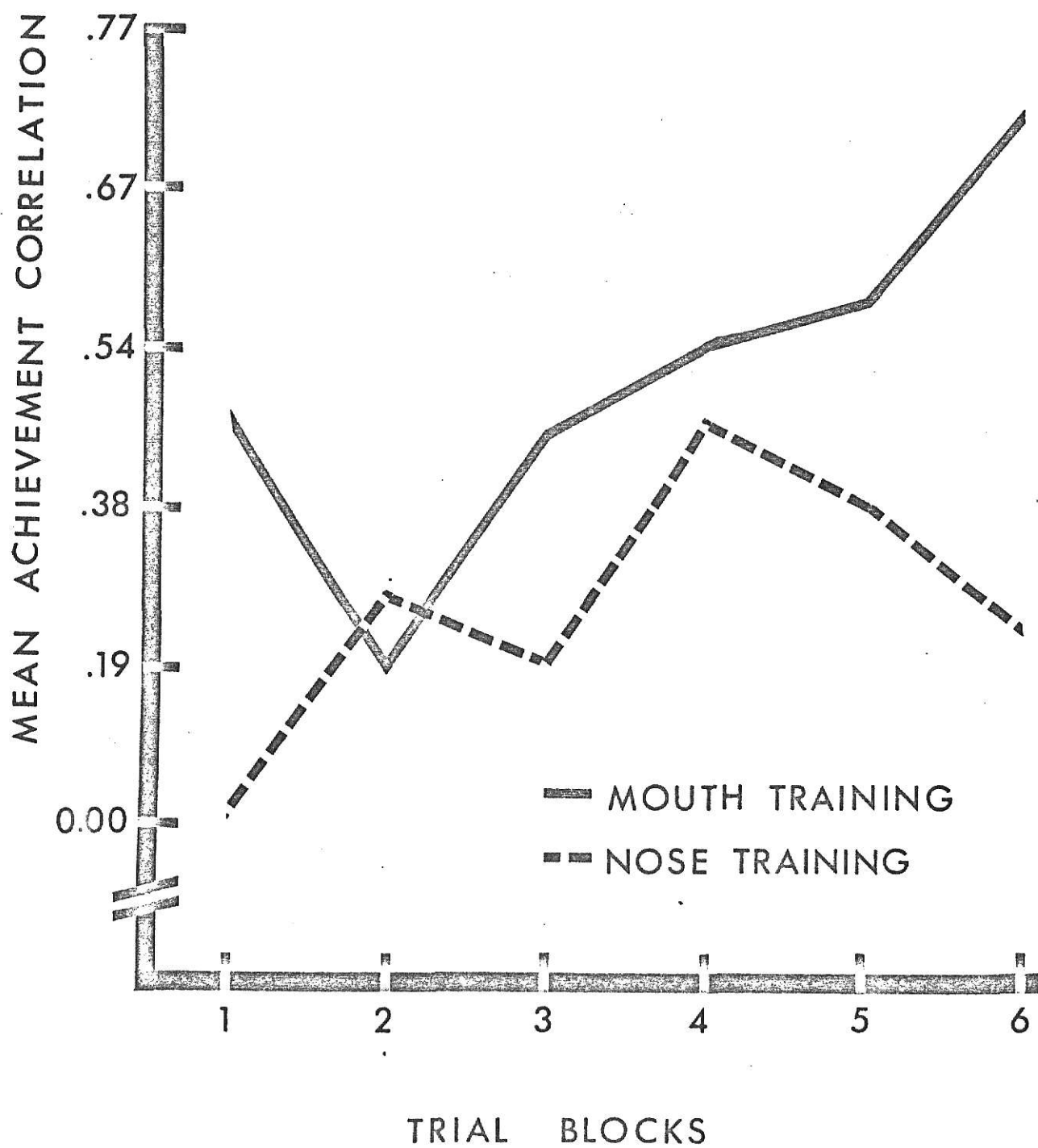


TABLE 1

Analysis of Variance of Mean Achievement Correlations for all
Subjects in Training

Source	SS	DF	MS	ET	F
Age (A)	.039	2	.020	1	.1627
Blocks (B)	.634	5	.127	2	5.5204**
Cue (C)	.499	1	.499	1	4.1468*
A x B	.162	10	.016	2	.7059
B x C	.461	5	.092	2	4.0088**
A x C	.239	2	.120	1	.9930
A x B x C	.178	10	.018	2	.7722
Error Term (s)					
Subj. W. Groups (1)	5.055	42	.120		
B x Subj. W. Groups (2)	4.827	210	.023		

*p < .05

**p < .01

TABLE 2

Mean Achievement Correlation By Age and Training Condition
(last thirty trials)

		Training Cue	
		Mouth	Nose
Age	1st Grade	.56**	.210
	6th Grade	.394*	.355*
	College	.565**	.293

*p < .025

**p < .005

Figure Caption

Fig. 5. Mean achievement correlations for mouth-trained subjects utilized in the conflict stage.

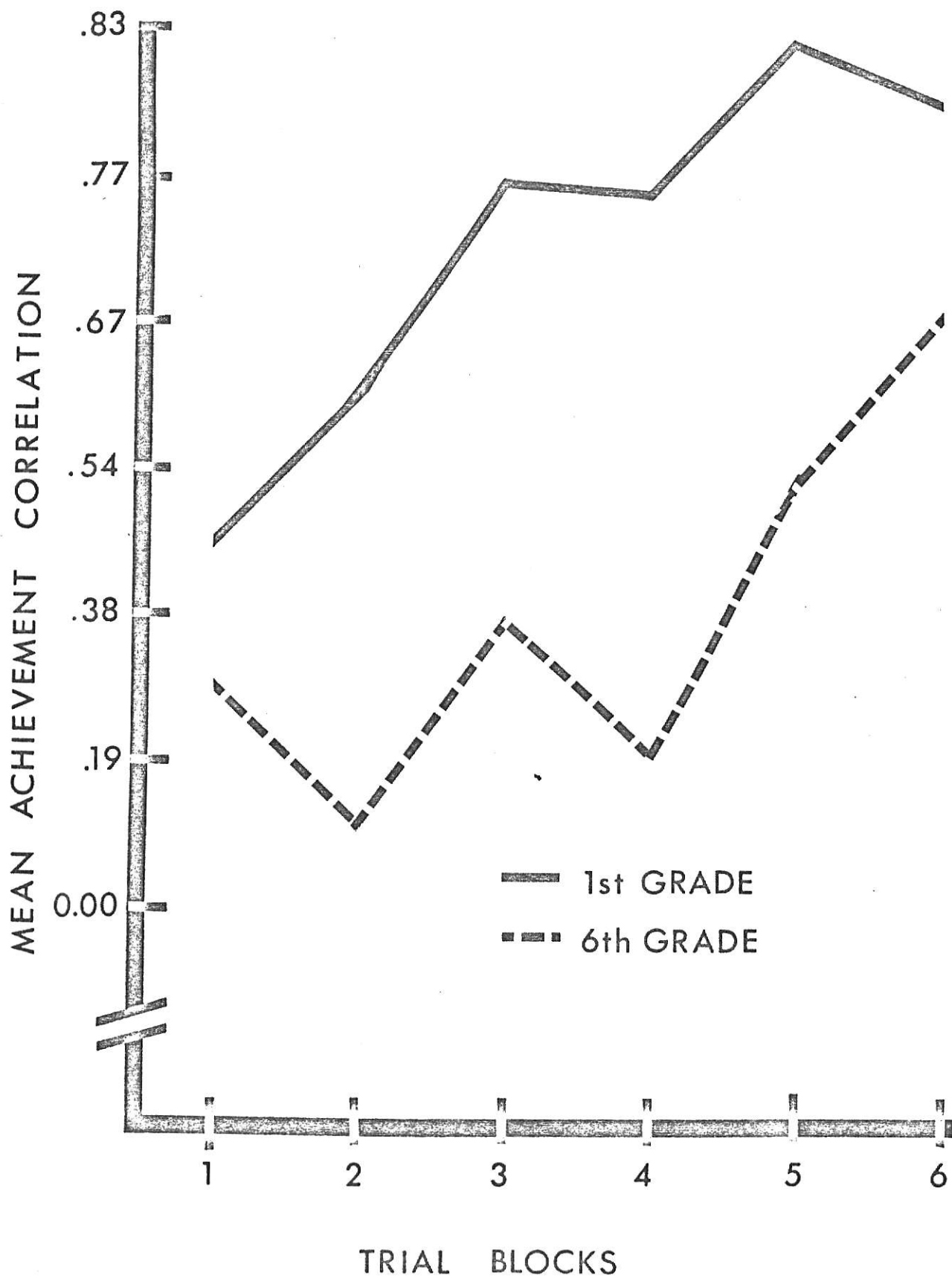


Figure Caption

Fig. 6. Mean achievement correlations for nose-trained subjects utilized in the conflict stage.

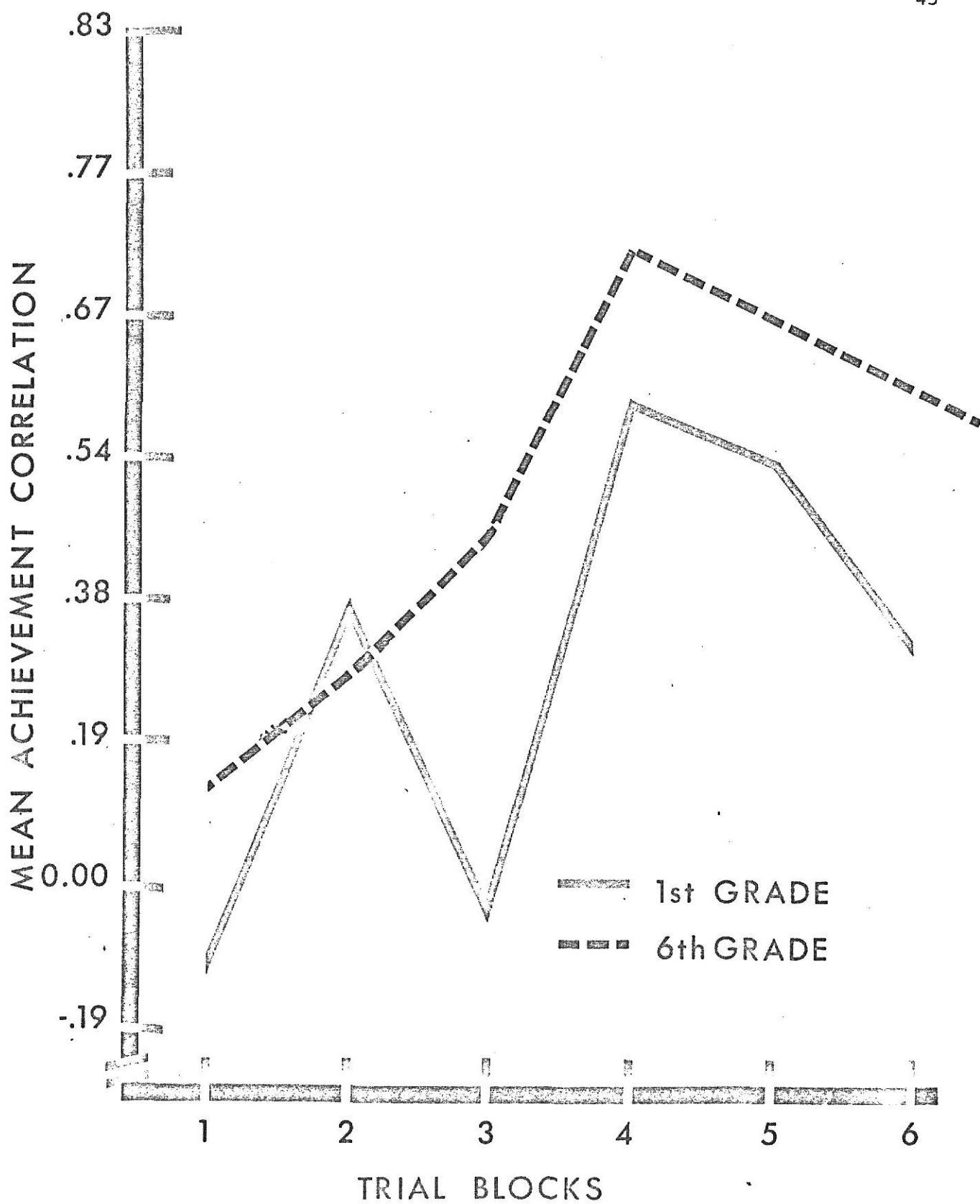


TABLE 3

Analysis of Variance of the Mean Achievement Correlations in
Training for Subjects Utilized in the Conflict Stage

Source	SS	DF	MS	ET	F
Age (A)	.076	1	.076	1	.4381
Blocks (B)	1.069	5	.214	2	7.234**
Cue (C)	.277	1	.277	1	1.5956
A x B	.133	5	.027	2	.8973
B x C	.332	5	.066	2	2.2479
A x C	.881	1	.881	1	5.0749*
A x B x C	.117	5	.023	2	.7933
Error Term (s)					
Subj. W. Groups (1)	3.124	18	.174		
B x Subj. W. Groups (2)	2.659	90	.030		

*p < .05

**p < .005

TABLE 4

Mean Group Achievement Correlations in Training for Subjects Utilized in
the Conflict Stage

	Training Cue	
	Mouth	Nose
Age		
1st Grade	.717**	.293
6th Grade	.400*	.517**

*p < .025

**p < .005

correlations indicating the effectiveness of training. It is notable that the more significant dependence on the relevant cue in the mouth condition is in line with the higher mean achievement correlations of subjects trained in that condition.

An analysis of variance was applied to these mean cue weights for each age level, for each training condition, across six ten-trial blocks. The mean cue weight for each ten-trial block was computed by correlating only responses on each of the ten trials with the appropriate cue values. Table 5 presents a summary of this analysis. A reliable main effect for trial blocks ($F(5,210) = 6.57, p < .005$), a reliable main effect for relevant training cue ($F(1,42) = 5.61, p < .05$), and a reliable blocks x cue interaction indicate that there was a significant increase in dependence on the relevant cue in each condition, with a greater increase in dependency occurring for one condition than the other. Figures 7 and 8 clearly show the significant increase in cue dependency for all subjects, with the subjects trained on the mouth cue demonstrating a greater improvement than the nose-trained subjects.

Although there is no main effect for age, there is a reliable age x blocks interaction ($F(10,210) = 1.30, p < .05$). Figure 3 indicates this to be a result of a greater relative shift for first grade subjects; and, furthermore, that the sixth grade subjects, while showing a lower mean dependency at the start of training than the college subjects, and a greater mean dependency than the first grade subjects, are, at the end of training highest of the three.

In summary, when all subjects are grouped together across all conditions, their mean achievement is better than chance, and their accuracy improves across trials.

Figure Caption

Fig. 7. Mean cue weights for all subjects following training in the mouth condition.

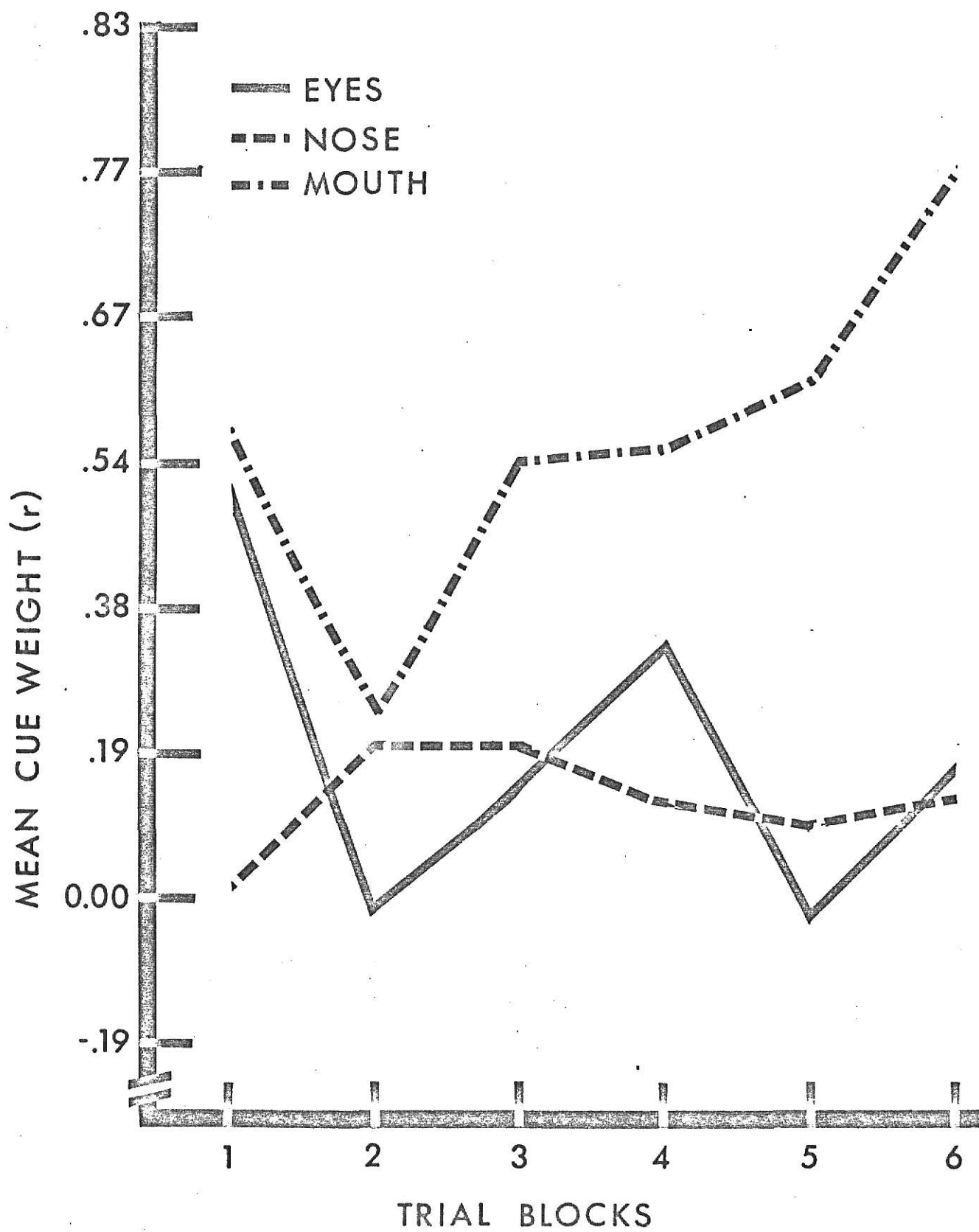


Figure Caption

Fig. 8. Mean cue weights for all subjects following training in the nose condition.

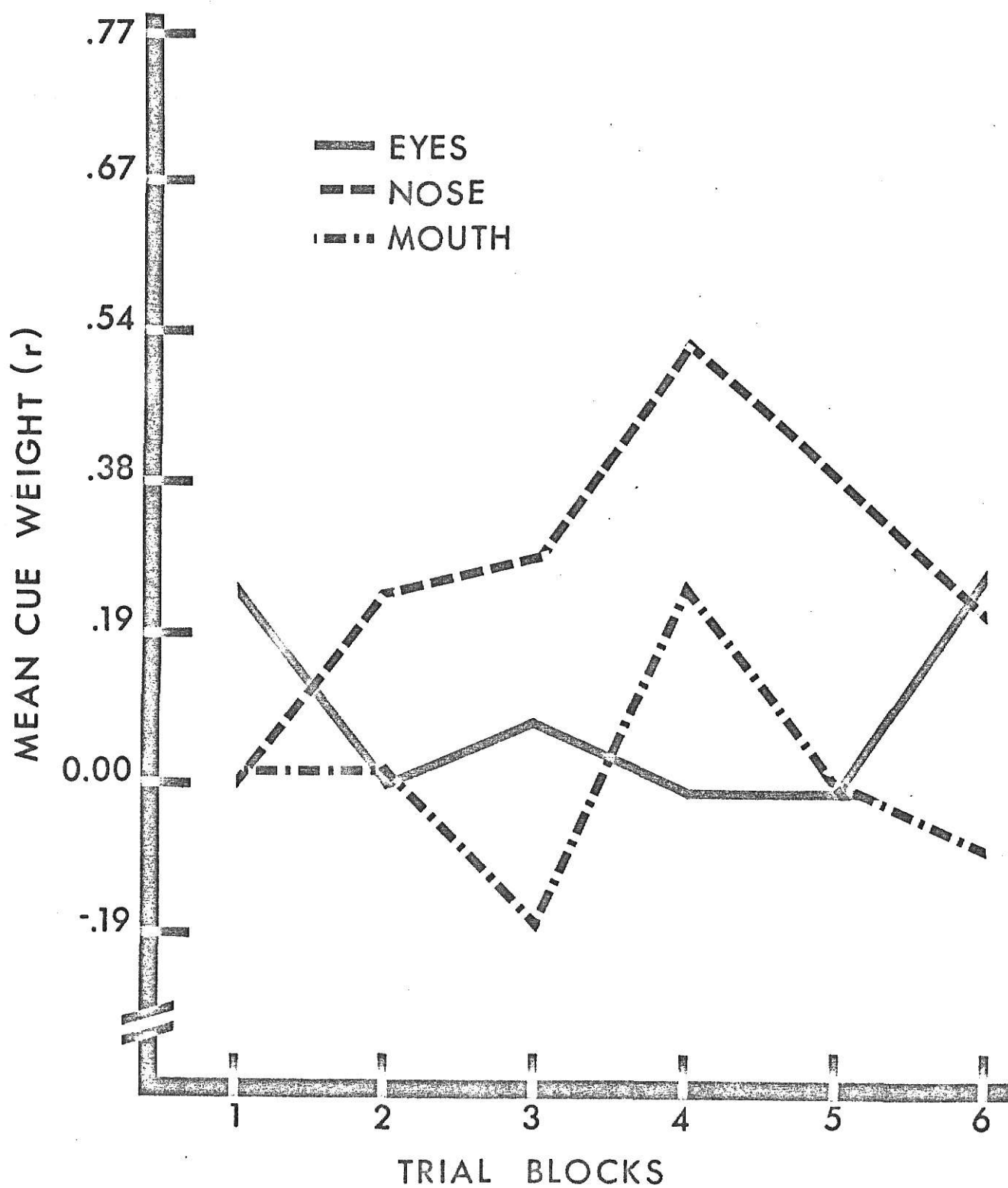


TABLE 5

Analysis of Variance of Mean Cue Weights for All Subjects in Training

Source	SS	DF	MS	ET	F
Age (A)	.079	2	.039	1	.2774
Blocks (B)	.728	5	.146	2	6.5737***
Cue (C)	.796	1	.796	1	5.6128*
A x C	.289	10	.029	2	1.3041*
B x C	.610	5	.122	2	5.5091**
A x C	.283	2	.142	1	.9985
A x B x C	.216	10	.022	2	.9750
Error Terms(s)					
Subj. W. Groups (1)	5.953	42	.142		
B x Subj. W. Groups (2)	4.649	210	.022		

*p < .05

**p < .01

***p < .005

These results are contrary to our prediction about the effects of egocentrism, namely that if egocentrism influenced performance, the first grade subjects would show significantly less response to training.

Another unexpected result here is that achievement was significantly affected by the nature of the relevant training cue, such that the qualitative nature of the cue had a differential effect with age and with performance across trials. Overall, mouth-trained subjects showed significantly better achievement than nose-trained subjects. This result was not suggested by past research on multiple-cue training which indicates that the nature of a given cue does not characteristically influence achievement. The implications of this finding are discussed in detail in the following chapter.

Conflict Stage

Pair selection

Subjects were paired for the conflict stage according to their errors on the last ten trials of the training task. Table 6 lists the subjects in rank-order with their respective deviation score total. One first grade pair was dropped after failing to complete the entire thirty trials of the conflict stage for reasons unknown to the experimenter. This reduced the number of pairs in the first grade group to four.

Individual Achievement

For all subjects the mean achievement correlation for their initial private judgments in the conflict stage was significantly better than chance ($r = .33$, $p < .05$). Figure 9 also indicates that the shift in cue weights over trials was in the direction of the significant cue, thus indicating that the subjects were responding effectively to the new cue validities in the second stage.

TABLE 6

Rank-ordering of Subjects used in conflict Stage by
Deviation Score Total

<u>First Grade</u>			
Nose Training	Number of Deviations		Mouth Training
S1	15	4	S2
S3	17	5	S4
S5	18	8	S6
S7	18	13	S8
S9	20	19	S10
S11	25	20	S12
S13	25	24	S14
S15	31	29	S16
S17	33		
<u>Sixth Grade</u>			
S1	6	15	S2
S3	14	18	S4
S5	18	19	S6
S7	22	20	S8
S9	24	23	S10
S11	24	25	S12
S13	25	27	S14
S15	26	28	S16
S17	28	29	S18
S19	30	30	S20
S21	31		

Figure Caption

Fig. 9. Mean cue weights for all subjects following the conflict stage.

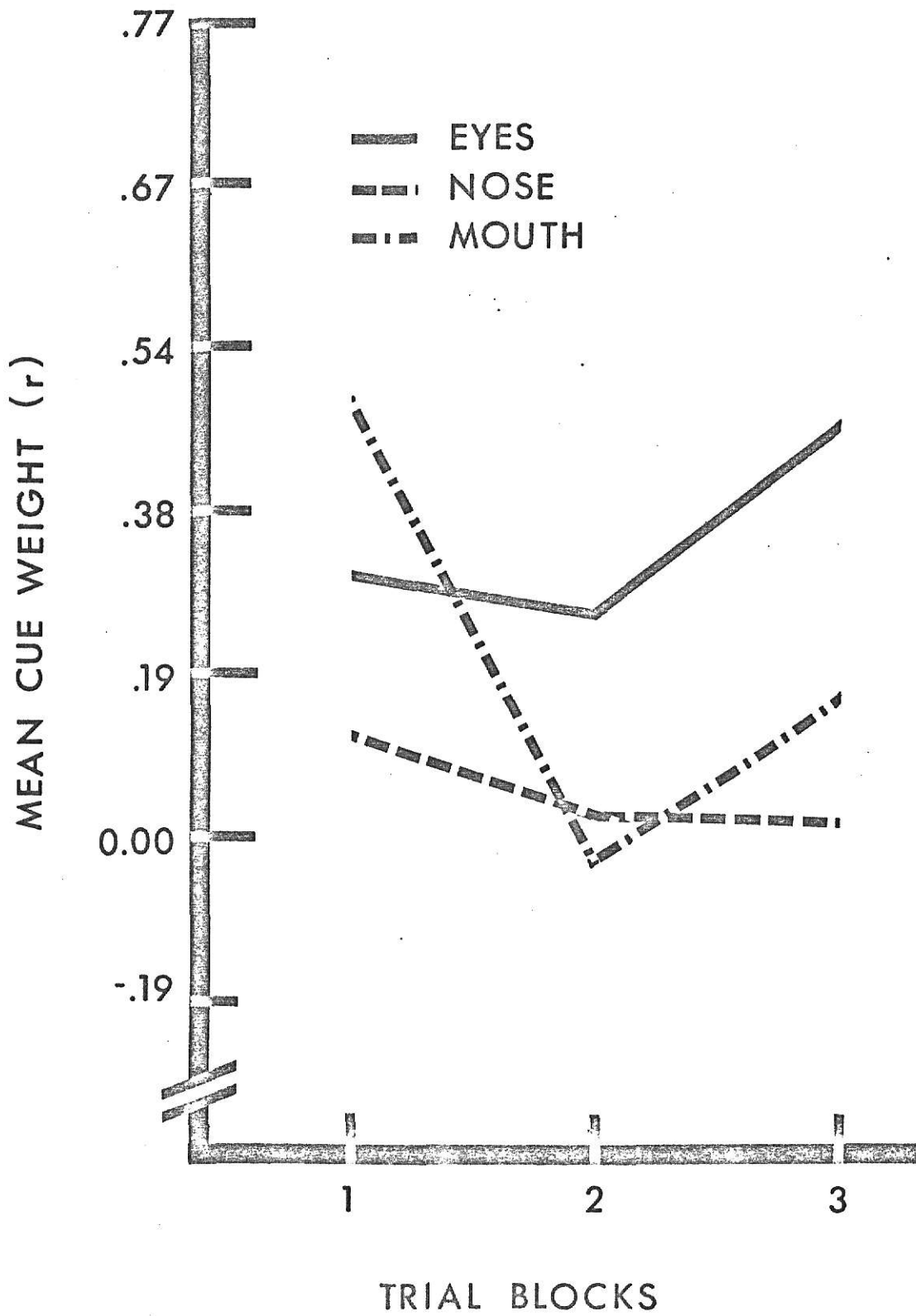


TABLE 7

Analysis of Variance of Mean Achievement Correlations for the First
Private Judgment of All Subjects in the Conflict Stage

Source	SS	DF	MS	ET	F
Age (A)	.077	2	.039	2	1.4120
Blocks (B)	.075	1	.075	1	.5738
Cue (C)	.178	1	.178	1	1.3670
A x B	.235	2	.117	2	4.2852**
B x C	.209	2	.105	2	3.8202*
A x C	.033	1	.033	1	.2536
A x B x C	.028	2	.014	2	.5128
Error Term (s)					
Subj. W. Groups (1)	2.088	16	.131		
B x Subj. W. Groups (2)	.877	32	.027		

* p < .05

**p < .025

Table 7 summarizes the analysis of variance applied to the mean achievement correlation coefficients for all paired subjects' initial private judgment across three ten-trial blocks. No reliable main effects were obtained. Thus, neither age, cue, or trials were significant. This is contrary to predictions based on egocentrism which suggested that the performance of the sixth grade subjects should have been significantly better than that of the first grade subjects.

There is a reliable blocks x age interaction ($F(2,32) = 4.28, p < .025$). A plot of the mean achievement correlations by groups as a function of trials (see Figure 10) indicates that the interaction is due to a significant improvement in accuracy for the first grade subjects and a decrease in accuracy for the sixth grade group. In addition, while the initial achievement of the first grade pairs is significantly less than that of the sixth grade pairs, the final level of achievement reached by the first grade pairs is greater.

The blocks x cue interaction was also significant ($F(2,32) = 3.82, p < .05$). Figure 11 indicates that subjects trained on the nose cue increased their accuracy over trials in this stage, while those trained on the mouth cue remained at the same level. Examination of the mean achievement correlations by age level for each training condition (see Table 8) indicates that both groups trained on the nose cue performed at significant levels of accuracy in the conflict stage, but subjects trained on the mouth cue failed to show significant achievement.

In general, these results are contrary to the expectation that because of their egocentrism, first graders would have greater difficulty adapting to the new cue validities.

In addition, and regardless of their ages, subjects trained on the nose cue achieved significantly better than the mouth-trained subjects.

Figure Caption

Fig. 10. Mean achievement correlations of initial judgments made by all subjects in the conflict stage with respect to age.

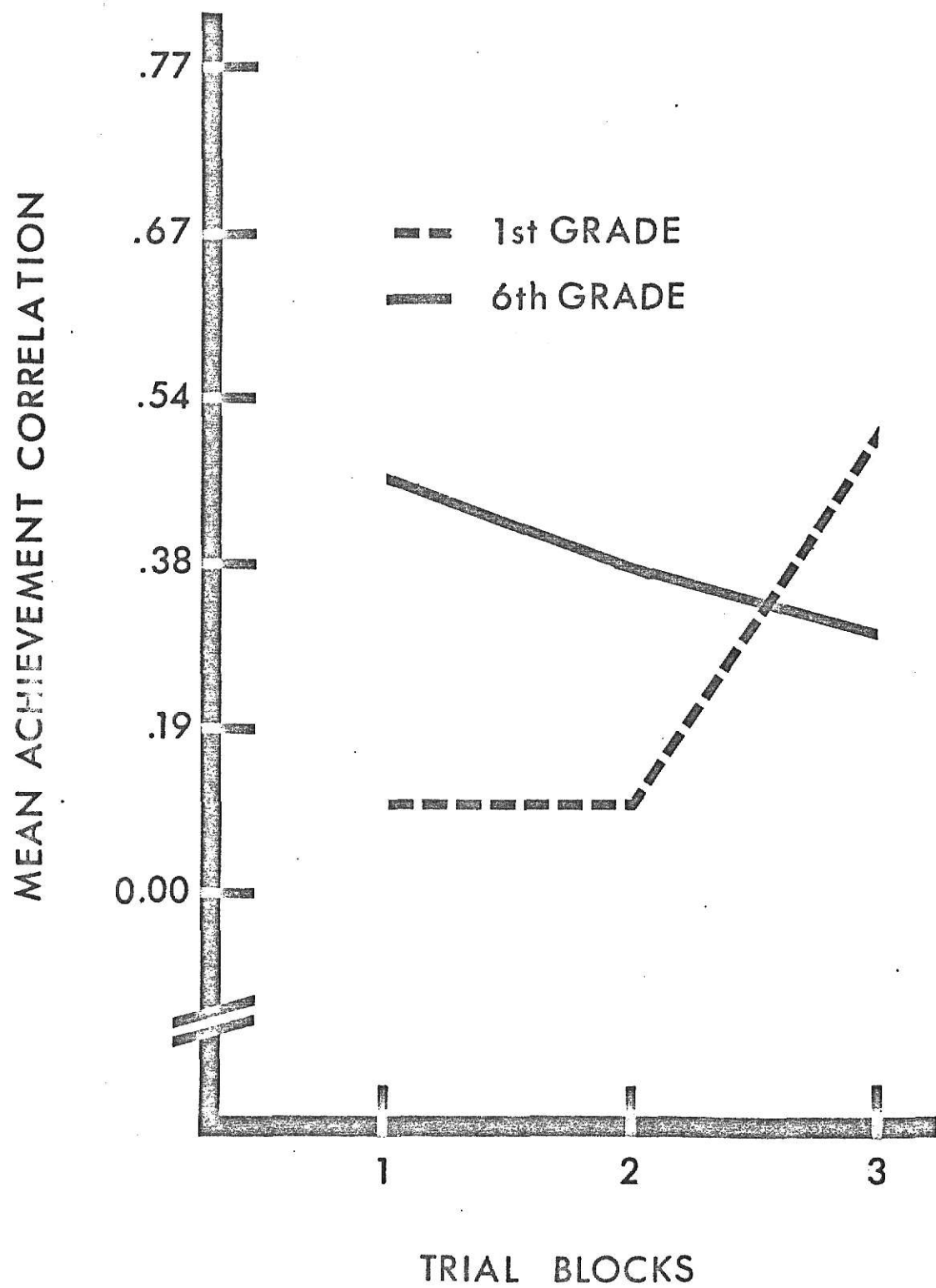
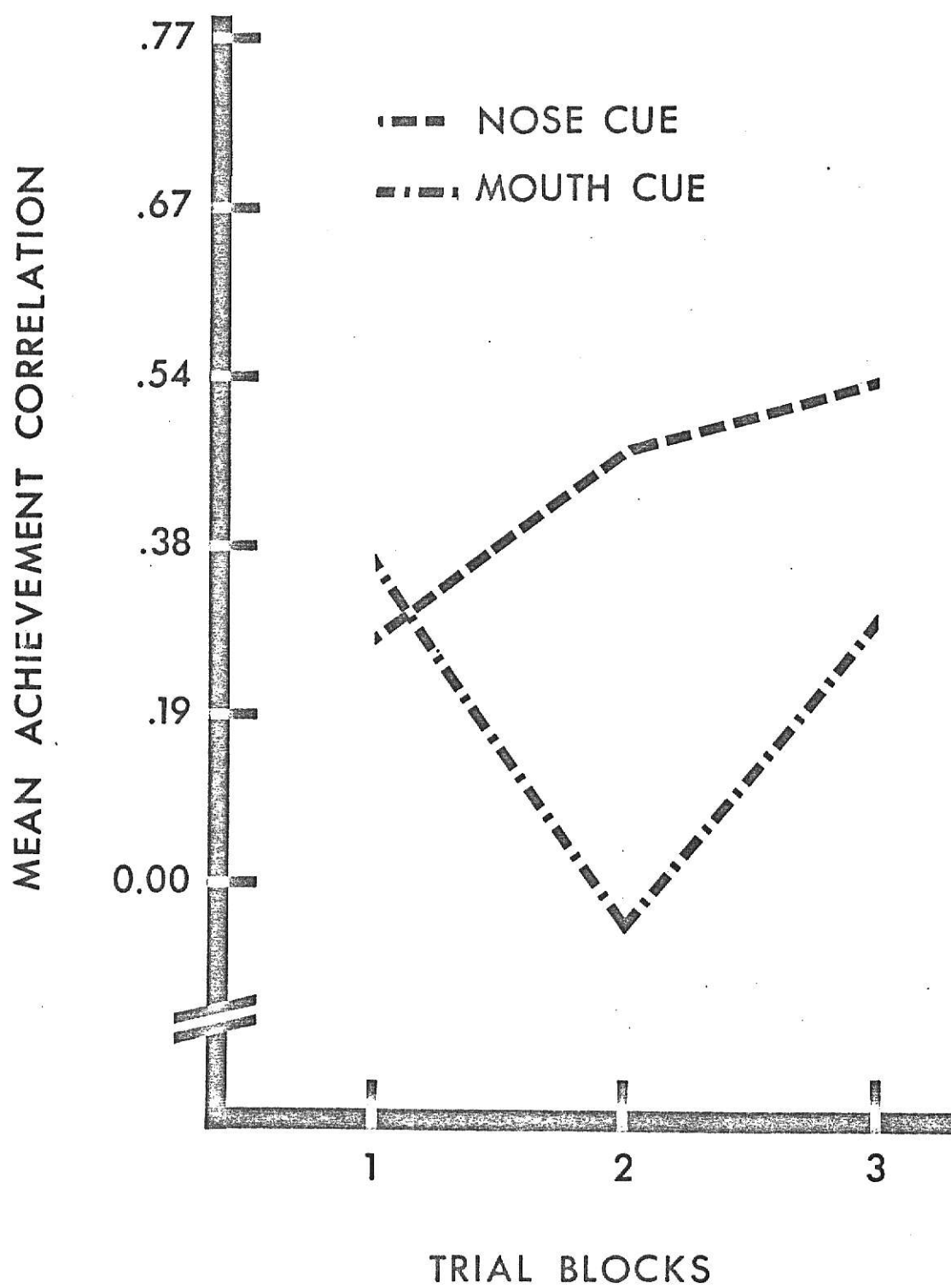


Figure Caption

Fig. 11. Mean achievement correlations of initial judgments made by all subjects in the conflict stage with respect to training condition.



Since earlier findings (p. 35) showed that the mouth cue was better learned during training, it is not surprising to see the mouth-trained Ss having more difficulty shifting to the new eye cue.

Group Performance

Joint Achievement

The mean joint achievement for all subject pairs working on the conflict task was significant ($r = .33$, $p < .05$), indicating both groups were able to cooperate in making accurate judgments and adapting to the new cue validities despite discrepant training.

Table 9 summarizes the analysis of variance applied to the mean achievement correlations for the judgments made jointly by the first and sixth grade pairs in the conflict task. There were no significant effects. However, the age x blocks interaction does approach significance ($F(2,16) = 2.95$, $p < .10$) suggesting that the first grade subjects, while not differing from the older subjects initially, showed a sharp increase in joint achievement in the last ten trials.

The age x blocks interaction and the significant overall achievement are contrary to our prediction. It was expected that the first grade subjects would demonstrate notably poor achievement if egocentrism influenced their behavior.

Overt Conflict

Overt conflict is computed by taking the difference between the first private judgment of each subject in a pair. As seen in Figure 12, the first grade pairs show consistently more overt conflict than the sixth grade pairs for the first twenty trials. However, there is a reversal for the last ten trials. An analysis of variance was applied to the mean conflict scores for six five-trial blocks, and is summarized in Table 10. There are no significant

TABLE 8

Mean Achievement Correlations-First Private Judgment in Conflict
Stage by Age and Training Cue

	Training Cue	
	Nose	Mouth
Age		
1st Grade	.318*	.188
6th Grade	.532**	.238

*p < .05

**p < .005

TABLE 9

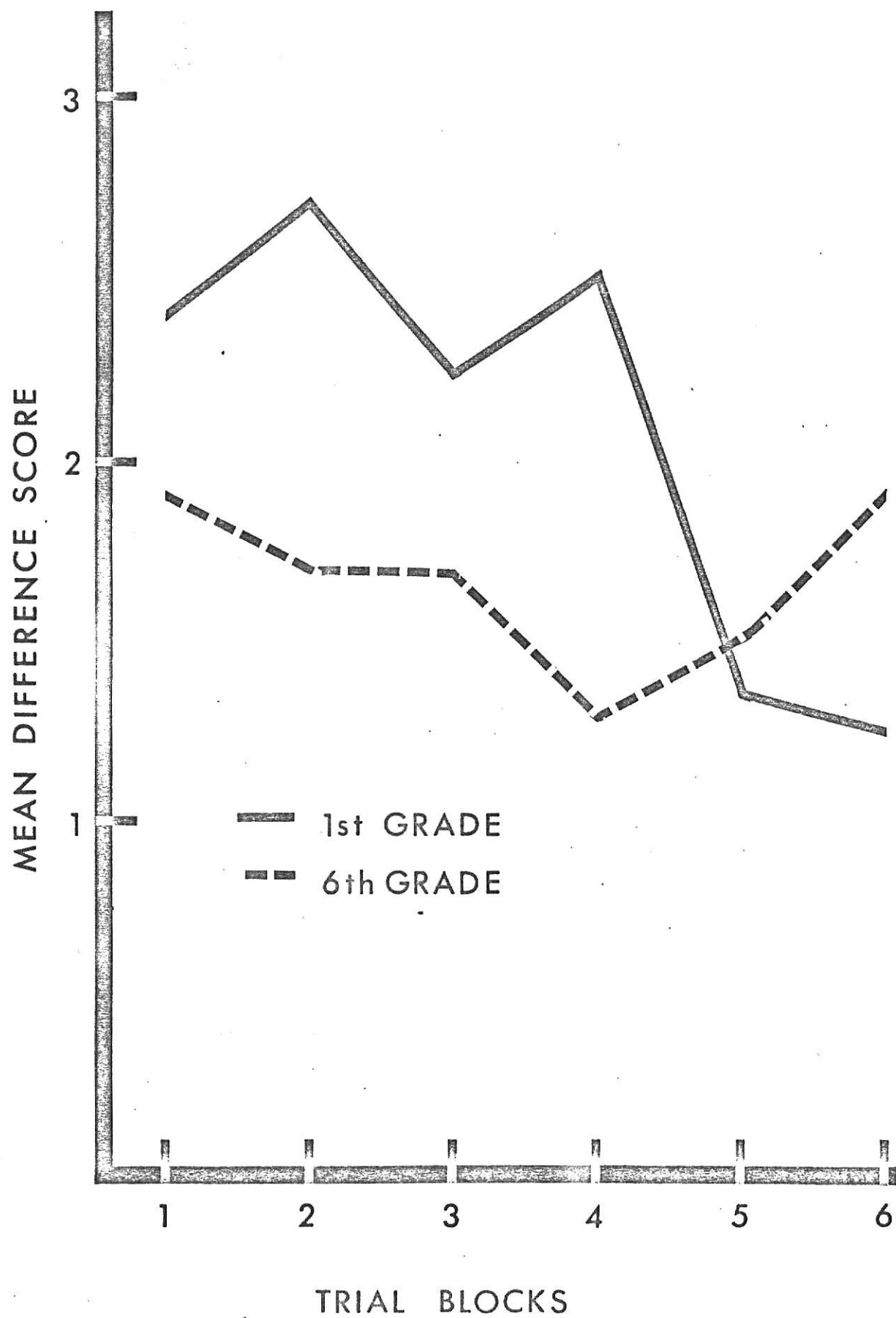
Analysis of Variance of Mean Achievement Correlations - Joint Judgment

Source	SS	DF	MS	ET	F
Age (A)	.039	2	.019	2	.7137
Blocks (B)	.105	1	.105	1	1.2682
A x B	.159	2	.080	2	2.9455*
Error Term (s)					
Subj. W. Groups (1)	.665	8	.083		
B x Subj. W. Groups (2)	.433	16	.027		

*p < .10

Figure Caption

Fig. 12. Mean overt conflict scores per pair plotted as a function of trial blocks by age.



effects.

Covert Conflict

Covert conflict is the difference between the second private judgments made by each pair of subjects. As seen in Figure 13, the first grade subjects consistently show more covert conflict. However, an analysis of variance (see Table 11) applied to these scores yielded no significant effects.

It may be noted, however, that the direction of the difference between the two groups is consistent with our prediction. That is, as a result of the influence of egocentrism on their cooperative behavior, the first grade subjects would show a higher level of conflict that would fail to diminish over trials.

Cognitive Change

Cognitive change is the difference between individual subjects' first and second private judgments on a given trial. As Figure 14 indicates, an analysis of variance applied to the mean cognitive change for each group over six five-trial blocks showed no significant effects. This does not support our prediction that the egocentrism of first grade subjects would lead them to show significantly less change.

Summary

Overall, the results show that training was effective leading to better than chance achievement by all subjects grouped together. In addition, there were no age-related differences in the ability to make accurate judgments on a multiple-cue task. Such age-related differences in performance would have been an indication of egocentrism.

In the conflict stage, there were no age-related differences in the ability to adapt to a second set of cue validities. There was also no sign of influence of egocentrism in performance evidenced in the various measures utilized in the

TABLE 10
Analysis Variance of Mean Overt Conflict Scores

Source	SS	DF	MS	ET	F
Age (A)	.227	1	.227	1	1.4024
Blocks (B)	.666	5	.133	2	1.1012
A x B	1.033	5	.207	2	2.1741
Error Term (s)					
Subj. W. Groups (1)	1.648	8	.206		
B x Subj. W. Groups (2)	3.801	40	.095		

Figure Caption

Fig. 13. Mean covert conflict scores per pair plotted as a function of trial blocks by age.

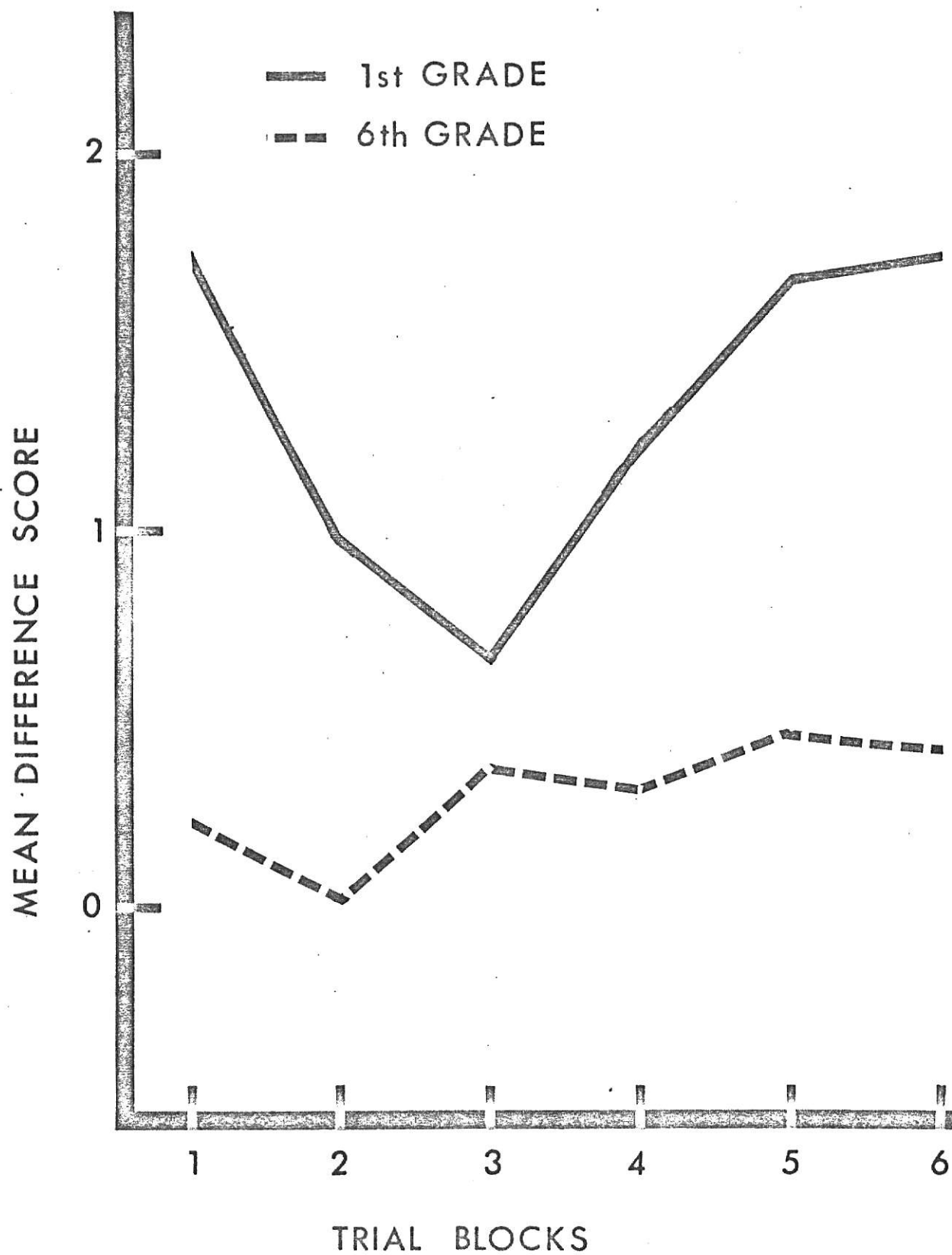


TABLE 11
Analysis of Variance of Mean Covert Conflict Scores

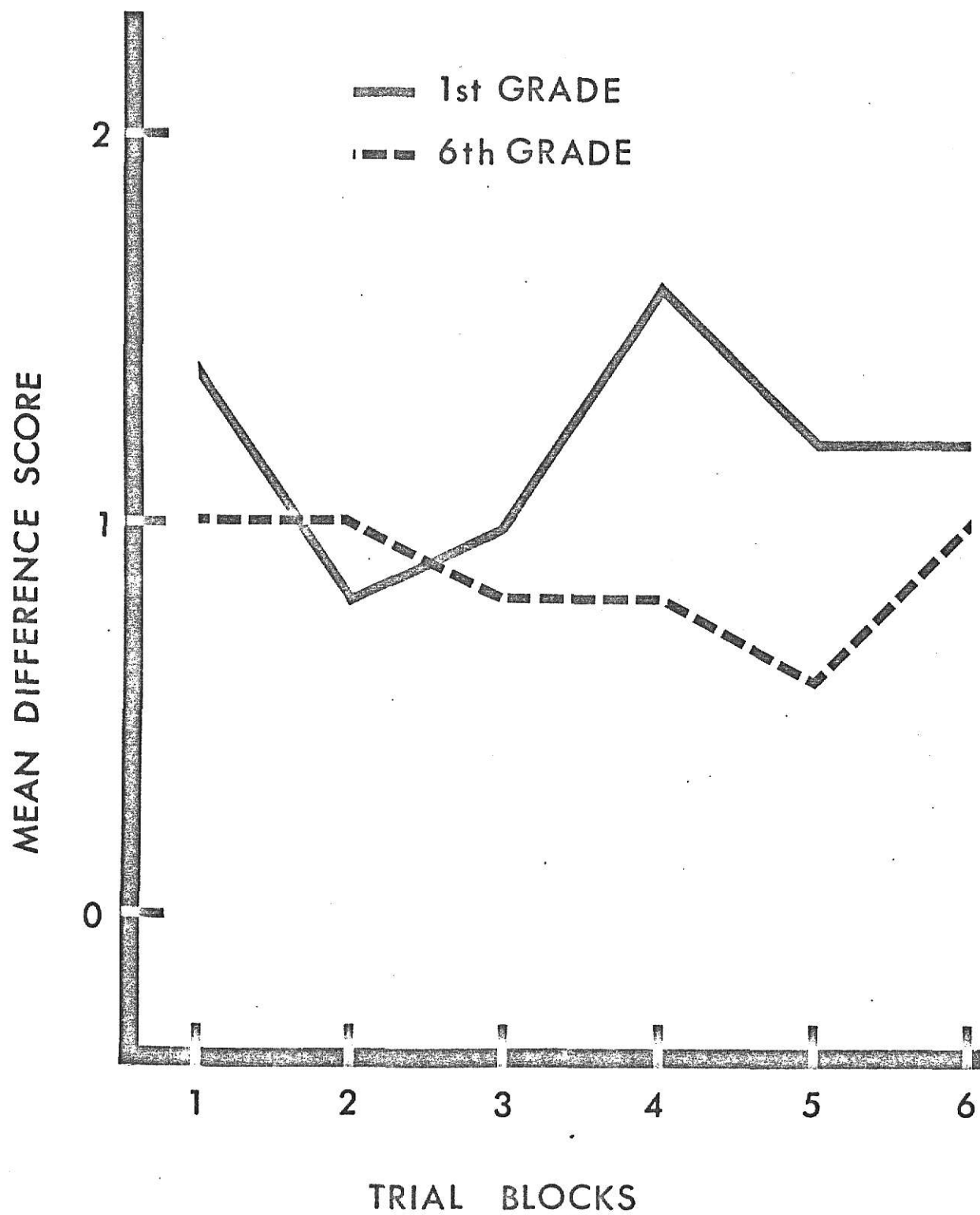
Source	SS	DF	MS	ET	F
Age (A)	6.41	1	6.41	1	3.19
Blocks (B)	2.44	5	.488	2	1.03
A x B	1.12	5	.244	2	<1
Error Term (s)					
Subj. W. Groups (1)	16.1	8	2.01		
B x Subj. W. Groups (2)	18.96	40	.474		

conflict stage.

Finally, training and subsequent performance in the conflict stage was found to be effected by the qualitative nature of the cue.

Figure Caption

Fig. 14. Mean cognitive change scores plotted across trial blocks by age.



DISCUSSION

Egocentrism

The most significant result of the present study was that no simple age-related differences in performance were found in either the training or conflict stage. It was predicted that egocentrism in the younger (first grade) subjects would influence performance in each of these stages. The first graders were expected to have more difficulty than the sixth graders learning the multiple-cue task and, after reaching a significant level of achievement in training, to have more difficulty in reaching significant levels of achievement in the conflict stage. Failure to obtain such age-related results suggests that egocentrism does not influence performance in this situation.

However, one unexpected result suggests that egocentrism may influence performance in a more complex way than measured in the present study. Achievement in training and in the conflict stage was influenced by the qualitative nature of the cues. The first grade mouth-trained subjects achieved better than the sixth grade mouth-trained subjects. Both age levels trained with the mouth as the significant cue achieved at better than chance levels. But the first grade nose-trained subjects performed more poorly than the sixth grade nose-trained subjects (The difference was not significant.).

It is conceivable that this interaction is due to the influence of egocentrism. The nose may be less salient for the younger subjects. This notion is supported by the spontaneous drawings of children in this age range. In viewing such drawings recently¹, the author noted that children five and six years old drew faces devoid of noses. Since the nose is the only feature of

¹The paintings were observed at a display of the art work of children who attended the Kansas State University nursery school.

the face that does not change dramatically for different facial expressions, it may be less salient for younger children. Only after their development has progressed to where they take into account broader and less obvious perspectives are they able to appreciate the different parts of the face in the same way. If one accepts the notion that development moves from an action orientation to a thought orientation as suggested by Piaget (1952) and Bruner (1966), then this interpretation seems plausible. The nose is less salient to the young child because of its lack of movement. This interpretation will be discussed in more detail later in connection with other relevant research.

Lens Model Paradigm

The findings of this exploratory study suggest a tentative conclusion concerning the generality of the lens model paradigm. The fact that no age-related differences were found in any of the measures employed leads to the conclusion that the generality of Hammond's lens model may be extended to include children as young as those in the first grade (\bar{x} age: 6:9 years). Contrary to expectations, however, this paradigm does not appear to be especially useful for studying egocentrism; and the measures intrinsic to the paradigm do not seem appropriate for capturing the egocentric quality of child behavior.

In general, the specific lens model measures listed below all yielded results contrary to predictions based on egocentrism. But one or two results do suggest that performance was influenced in a more complex way by such a mechanism.

1. Training Achievement Contrary to prediction, the mean achievement for all subjects reached a significant level and improved significantly over trials. According to predictions based on developmental theory, the younger (first grade) subjects were expected to find greater difficulty in achievement

due to their inability to decenter.

Although these results are not consistent with developmental theory, they fit certain research findings on probability learning done within the framework of Reinforcement Theory. Weir (1964) found that younger children maximize (i.e. find the highest probability cue and remain with it) while older children (adolescents) attempt to match probabilities and, therefore, have greater difficulty performing such tasks. The results of the present study are consistent with these findings despite two factors that distinguish it from the earlier research. The task used in the present study required a unitary judgmental response to the array of cues; and there was no extrinsic reward for correct responding. The Weir task employed extrinsic rewards and the subjects responded to each separate cue by selecting from among alternative responses (levers). However, the consistency between the results obtained from research using both tasks suggests that these differences may not be important.

Although achievement was significant for all subjects grouped together, the qualitative nature of the cues influenced the level of achievement reached. This result suggests that egocentrism did influence achievement. As discussed above, children in the younger age group may center on the facial features that are associated with movement. The less mobile features, particularly relative to size would then be less salient to them, as these data and spontaneous children's paintings suggest. But other research indicates an alternative interpretation of how egocentrism may have influenced training performance in the present study.

Investigating schizophrenics, Gillis (personal communication) begins with the premise that they tend to have a narrow focus, or a single track way of understanding their environment. Accordingly, he hypothesized they would have less difficulty learning a task with one high validity cue than a task with

three equally valid cues. The tendency for these subjects to view the environment in a more narrow fashion would become evident in this task by their tendency to pick one cue and rely on it in a manner similar to the young children in Weir's research. Since Gillis finds that schizophrenics do learn the task with one significant cue better than the task with three equally weighted cues, his view is supported.

Accepting Gillis' findings, and assuming the narrow focus of schizophrenics to be analogous to the centering characteristic of egocentrism, the present findings may be interpreted as follows. Younger children should be quite able to learn a multiple-cue task having only a single high validity cue, as found in this study, but greater difficulty in learning a task containing more than one high validity cue. However, data collected in the present experiment are not appropriate for testing this idea.

Thus, there are two interpretations that can explain the data in line with egocentrism: (1) the inability to decenter influences children to perform well where only one cue is significantly related to the criterion; unless, (2) they perceive the cues as differentially salient and this differential in perception is conceived to be a form of egocentrism.

2. Individual Achievement (Conflict Stage) Again, all subjects grouped together reached a significant level of achievement, contrary to prediction. Egocentrism was expected to influence performance in this stage such that the younger children would find greater difficulty adapting to a second set of cue validities. The first grade subjects showed less difficulty in achieving on the second set of cue validities than the sixth grade subjects. The conclusion that can be drawn from the result at this level is that egocentrism does not influence behavior in this paradigm.

However, there was an interesting result with respect to the prediction

that better learning on the training task would make for greater difficulty in the conflict stage. As in training, the qualitative nature of the training cue influenced performance in the conflict stage. The subjects trained to rely on the mouth cue had more difficulty learning the second set of cue validities (eyes - significant cue) than the nose-trained subjects (see table, p.57). This was particularly evident for the first grade subjects. This result differs from findings obtained in previous research with adults, where the qualitative nature of the cues apparently do not influence performance. But the present result is consistent with the prediction that first grade subjects would have greater difficulty learning a new set of cue validities following successful training on an initial set of cues.

The data here can be interpreted in two ways. First, it can be the result of egocentrism in line with the stated prediction. The first grade nose-trained subjects do show relatively poor achievement in the training stage. In the conflict stage they achieve at a better than chance level, while the first grade mouth-trained subjects show significant achievement in training but do not achieve better than chance in the conflict stage. If this occurs because of egocentrism, then one would predict an age x cue interaction with the sixth grade subjects remaining unaffected by either the salience of cues or their level of prior training; they would show significant achievement in all conditions of the experiment. Since this was not the case, however, the data do not support a simple egocentrism interpretation. Instead, there was a significant age x blocks and a significant cue x blocks interaction. The second interaction indicates that the salience of the cue is effecting performance, but not for developmental reasons, since the effect holds across ages.

The second interpretation is based on the age x blocks interaction, which is consistent with the work of the Kendlers on what they term reversal and

non-reversal shifts. As discussed in Chapter 2, Kendler and Kendler (1962) reviewed a series of studies on research dealing with this phenomenon in children. They concluded that younger children have less difficulty making non-reversal shifts than older children or adults.

It is possible to construe the change in significant cue from training to conflict stage in the lens model paradigm, as a non-reversal shift. That being the case, the present study is quite consistent with the work of the Kendlers.

Although Kendler and Kendler interpret their findings in S-R terms, they suggest that performance differences are the result of developmental changes which produce better cognitive mediation ability. Therefore, while present results are not consistent with predictions based on egocentrism they are consistent with developmental theory.

3. Joint Achievement The significant overall joint achievement indicates, contrary to prediction, that children this age are able to achieve on a co-operative task. Further, the first grade pairs showed a greater increase in joint achievement over trials than the sixth grade pairs. If the younger subjects were influenced by egocentrism as defined in the introductory chapters, their inability to take the perspective of the other should have hindered performance in the cooperative situation. But this was not the case. It would therefore seem that egocentrism does not influence children's ability to cooperate in a multiple-cue task.

4. Conflict The prediction that the first grade pairs would experience more conflict than the sixth grade pairs and have greater difficulty reducing that conflict due to their inability to take the perspective of the other person was not confirmed.

5. Cognitive Change According to predictions based on egocentrism, the first grade subjects were expected to show little or no cognitive change. To

the contrary, they exhibited more change than the sixth grade subjects, but the difference was non-significant. This result fails to support the notion that the younger subjects would tend to center on one policy and not deviate due to the influence of egocentrism.

Future Research

Although the results of the present study are largely contrary to theory-derived predictions, they provide a number of ideas which can serve as a valuable basis for future research.

The most interesting result was the effect that the qualitative nature of the cues had on performance. That effect, coupled with the recent research reported by Gillis, suggest an interesting direction for developmental research related to multiple-cue learning. Future studies might investigate effects of the qualitative and quantitative nature of cues on achievement of multiple-cue tasks.

With respect to quantitative cue-criterion relations, study should be made of the performance of children on multiple-cue tasks having more than one cue significantly related to the criterion. In addition, curvilinear as well as linear cue-criterion relations should be studied with children.

Problems related to the qualitative character of cues can be studied by manipulating their perceptual saliency, while controlling their quantitative significance. In addition, the configuration of the cues is important. The present study, as well as Gillis' work, suggest comparing differences between social cue configurations (i.e. facial features, etc.) and non-social configurations (e.g. geometric shapes and sizes). And it would also be useful to compare social configurations that present a perceptual gestalt with non-social configurations that present a gestalt. Thus, the effect of the nature of the cues, both quantitative and qualitative, on achievement of children in a

multiple-cue tasks presents a large number of future research possibilities.

The result that the lens model paradigm does not appear especially useful for studying the egocentric quality of social interaction in young children, suggests research directed at the development of more appropriate techniques for studying interaction developmentally. The statistical measures employed in this paradigm do not seem sensitive to the kinds of egocentric behaviors emitted by young children while interacting.

One direction to proceed might involve the use of tasks more familiar to children yet able to be manipulated for experimental purposes. For example, one might investigate cooperative puzzle completion developmentally by manipulating the nature of the puzzle and the previous experience of the children with similar puzzles.

Summary

The two aims of the present study were: first to examine the behavior of children in Hammond's lens model paradigm for studying interpersonal conflict; and, second, to explore the feasibility of using this paradigm to study egocentrism in children. More specifically, the study explored whether there were any age-related differences in performance in the conflict paradigm; and if such differences could be predicted from cognitive-developmental theory.

Overall, there were no age-related differences in performance in either of the two stages of the lens model paradigm. In both the training and conflict stage all subjects grouped together reached better than chance levels of achievement. An interesting result was that performance in both stages was effected by the qualitative nature of the cue they were initially trained on.

From these results it can be concluded that: (1) the lens model may extend its gerrality as a research technique to include children as young as 6 years; (2) that egocentrism does not seem to be an influence on the behavior of

children 6 years old in the lens model situation; and, (3) the generality of egocentrism may not be extended to include behavior in this non-Piagetian task.

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APPENDIX A

Training Instructions

INSTRUCTIONSExplanation of the Task:

We are going to play a guessing game. We will play the game with faces and figures like these (show examples). The object of the game is for you to guess which of the figures matches the face you look at.

Task Cards:

On each face you see, the eyes, nose, and mouth will be different sizes. Also, you can see that the seven figures are all different sizes from very small to very large.

Procedure:

We will play the game in the following way:

- 1) first, I will show you a face in this book. Remember to look closely at the size of the eyes, nose, and mouth;
- 2) second, after you have looked at the face, try to guess which figure goes with the face. Point to the one you think it is;
- 3) after you make your guess, turn the page. The correct figure will be colored red on the back of the page so that you can find out if you were right;
- 4) after you find out the right answer, turn the page again and try to guess the next one.

Summary

So the way the game is played is; (1) you see the face; (2) point to the one you think is correct; and, (3) turn the page to find out if you guessed the right one.

Remember to look at the size of the eyes, nose, and mouth when making your guess.

Whenever you want to stop the game, tell me and we will.

APPENDIX B

Conflict Task Instructions

INSTRUCTIONSExplanation of the Task:

We are going to play the guessing game you each played separately a few days ago. But today, I want to see how well the two of you can guess together, and see if your two heads are better than one.

Task Materials:

We will play the game with the faces and the figures again (show examples). This time you each will use a little booklet to mark down your answers (show booklet).

Procedure:

We will play the game like this;

First, look at the face, paying particular attention to the size of the eyes, nose, and mouth. Be sure not to talk about it with the other person.

Second, mark an "x" in the booklet on the figure you guess is right. Be sure to do this without letting the other person see your answer.

Third, after you both have marked your "x", try to guess which figure you both think it is. You may talk to each other about which one you think is correct and even tell each other which figure you marked in your booklet.

Fourth, after you have talked about it and made a guess together, point out the one you guessed so I know.

Fifth, after you have pointed to the figure you guessed was correct together, turn the page in your booklet and mark again the figure you guess now is the right one. You do not have to mark the same one unless you still think it is correct.

Sixth, after you both mark your booklets a second time, I will turn the page in the book with the faces so you can see the right answer.

As an additional part of the game, if the one you pick together is exactly correct, you each get a cookie.

Summary

Let me repeat it once more. We play the game the following way:

(1) you see the face; (2) you guess which figure is the one it goes with, and mark an "x" on it in your booklet; (3) then you talk about which figures you each guessed were right and make a guess together; (4) point out the one you guessed together to me; (5) then turn the page of your booklet and mark the one you think it is, remembering it does not have to be the same; and, (6) I will turn the page and show you the right answer.

Remember to look at the size of the eyes, nose, and mouth on each face when you make your guess. You will get a cookie only if the guess you make together is exactly correct.

Whenever you want to stop the game, tell me, and we will.

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A DEVELOPMENTAL STUDY OF LEARNING,
CONFLICT, AND EGOCENTRISM

by

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AN ABSTRACT OF A THESIS

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This study relates two hitherto separate problem areas in psychology: cognitive development and cognitive conflict. The aims were: first, to examine the behavior of children in Hammond's lens model paradigm for studying interpersonal conflict; and, second, to explore the feasibility of using this paradigm to study egocentrism in children. More specifically, the study explored whether there were any age-related differences in performance in the conflict paradigm, and if such differences could be predicted from cognitive-developmental theory.

Seventeen first grade children, twenty sixth grade children, and ten college students served as subjects. They were all first tested individually on an uncertain judgment task involving the use of schematic faces. The pairs who had learned to rely on different cues were brought together on another version of the task and tested for both conflict and learning. It was assumed that their egocentrism would prevent the younger children from reaching significant achievement on the judgment task and generate greater conflict between them.

Overall, the results show that there were no age-related differences in performance in either of the two stages of the paradigm. In addition, it was found that performance was effected by the qualitative nature of the cue subjects were initially tested on.

The results were interpreted as: (1) indicating that egocentrism does not influence the performance of children in Hammond's conflict paradigm; and, (2) the generality of the paradigm can be extended to include children as young as 6 years.