PRIVATE SPEECH: THE EFFECT OF PRESENCE OF OTHERS, TASK, AND INTRAPERSONAL VARIABLES

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Ellen A. Stromnen

Major professor

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ABSTRACT

PRIVATE SPEECH: THE EFFECT OF PRESENCE OF OTHERS, TASK, AND INTRAPERSONAL VARIABLES

By

Jane Rath Dickie

Sixty middle-class subjects (10 boys and 10 girls of ages 2 1/2-4, 4-5 1/2, 6-8) were scored on measures of mental age, IQ, impulsivity, self-control, persistence, and success at a task. All Ss were video-taped under two conditions of person present in the room (mother and peer) and two conditions of activity (structured tasks and free play). The video-tapes were then rated for frequency and form of private (egocentric) and social speech. The results showed that increasing chronological age and mental age correspond to a decrease in impulsivity, an increase in self-control and an increase in persistence and success at a difficult task.

Analysis of private and social speech showed the major difference between young, impulsive, less controlled children and older, reflective, more controlled children was in the immature child's continued use of lower level private speech and social

speech, especially in the task situation. Activity significantly affected the form and frequency of private and social speech: more social speech and lower-level private speech was recorded during free play, where as more higher-level private speech was recorded during structured tasks. Also person present significantly affected form and frequency of private and social speech: generally, more social and private speech was recorded with peers than with mothers. The strength and direction of the effect was dependent upon the age of the child.

The results are interpreted in terms of their support for a developmental view which incorporates both Vygotsky's and Piaget's theories.

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Jane Rath Dickie

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DEDICATION

To Larry, who has always encouraged me, and Jennifer whose private speech stimulated this research and made it fun.

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INTRODUCTION

The bulk of theory and research pertaining to private speech suggests that it serves a critical role in the development of self-directed and self-controlled behavior, and it may be the early roots of thinking or problem solving. Clearly the ability to plan one's own actions is essential in any task. Meichebaum (1971) has recently shown that private speech may be taught to impulsive children in order to help them become more reflective in problem solving. This sort of training is exciting; however, without knowledge about the normal development of private speech and its correlates, further applied research may be difficult.

The current study attempted to clarify the topography, development, and function of private speech. It also looked at the effect of situational and intrapersonal variables on the type and frequency of private speech.

REVIEW OF LITERATURE

Background information on egocentric speech will cover, first, the function of egocentric speech and second, the topography of such speech. The underlying organization of this review is to deal with theory first and then research.

Theory

Egocentric or private speech, referred to by Piaget (1926) and others (Vygotsky, 1962; Flavell, 1966; Kohlberg, Yaeger, and Hjertholm, 1968) is audible speech apparently not addressed to any listener either because (a) it occurs with the child's apparent satisfaction even if the listener gives no sign of understanding or (b) it occurs when the child is alone. Egocentric speech has been observed and discussed in terms of its theoretical importance for cognitive and social development. Several theories have been proposed to account for its occurrence in the young child, its function, if any, and its decline with increasing age.

Piaget (1926) invoked the concept of egocentricity to explain private speech in the young child. He termed the child's early speech "egocentric" to reflect the inability of the child to see beyond his own point of view. The young child, particularly in attempting to communicate information to others, has difficulty differentiating his own perspective from that of others (Flavell, 1966; Flavell et al., 1968; Glucksberg, Kraus, and Weisberg, 1966). Piaget differentiated between two aspects of egocentric speech: a) that in which the child speaks about himself or his own ideas with no communicative function i.e. without desiring feedback from the listener, and b) that in which the child appears to want to communicate but he lacks the skill to do so. An example of the latter case is when the child invites participation in some fantasy but neglects to explain the fantasy sufficiently well for the listener to understand. These two aspects of egocentric speech involve the will of the child to communicate and the skill of the child to do so.

Piaget (1956) then theorized about the decline of egocentric speech in the development of the child. He suggested two forces which act to eliminate egocentric speech: a) cognitive development which makes the child aware of different perspectives (or gives him the skill to communicate) and b) social forces which occur via extensive interaction primarily with peers (giving the child the will

to communicate). Such interaction on an equal basis forces the child to integrate his goals with the goals of other children. This is not true in interactions with adults where the adult either serves the child's goals or constrains him. The adult is viewed as omniscient by the child and the child is thus less able to differentiate his own goals from the adult's goals. Thus Piaget hypothesizes that the child produces more egocentric speech in situations with adults than in situations with peers.

Vygotsky (1962) took issue with the "negative" connotations of Piaget's explanation of egocentric speech. Vygotsky felt that attributing to the child the lack of will and skill to communicate suggested that egocentric speech was maladaptive, i.e. serves no cognitive function. He went on to suggest a positive raison d'etre of private speech. Rather than the view of egocentric speech as "presocial" (Piaget, 1926) he proposed that egocentric speech serves the function of cognitive self-guidance. From this perspective private speech occurs because the child is not capable of more covert self-direction, thus he "thinks out loud." Since private speech in this view serves a self-directing function, or is communication directed to the self, it can naturally be more abbreviated and thus less understandable to the listener. That is, since the function is to direct the self, it is not due to lack of skill that such speech is incomprehensible to the listener.

In part, Vygotsky did agree with Piaget's concept of egocentrism in the child. This agreement is reflected by Vygotsky's specification of the difficulty that the young child has in communicating. The child fails to differentiate between communication to himself and communication to others. Although the two serve different functions, the structure of each is similar. This makes his speech to others too abbreviated to create understanding, and his speech to himself too long (uneconomical) in the function of guiding his own behavior. For this reason, later development condenses the self-guiding speech and eliminates social aspects which are not necessary for self-direction. Further development differentiates the social from the self-guiding mode of communication. Therefore, in the later stages, self-guiding communication is most apt to occur at times when the social and self-guiding functions are difficult to discriminate, that is, times when the listener is maximally similar to the speaker. This led Vygotsky to a prediction opposite Piaget's prediction: egocentric speech should be greater with peers than with adults.

Vygotsky also differed from Piaget with regard to the developmental decline of private speech. Vygotsky suggested that the decline occurs because private speech moves from overt to covert thought, from external self-direction to internal self-direction, and thus declines with the cognitive growth of the child.

A third theorist, Mead (1934) followed the Vygotsky line of thought, but went further to give an idea of the form of private speech. He suggested that private speech is functionally and structurally a dialogue if not explicitly, then implicitly. This dialogue, in which the child plays both speaker and listener, serves self-stimulation and self-orienting functions. It occurs to inform the self of what is occurring; that is, it serves a self-awareness function. Mead, like Vygotsky, stressed the fact that these dialogues (actually monologues) are not very economical and suggested this as the reason for their decline. The monologue finally reaches a higher level as inner speech or thought. Thus, he suggested that development proceeds in the following way: 1) the child will vocalize as though he were the listener, 2) he may then respond to himself in a dialogue, 3) finally he vocalizes only the active guiding response for his own behavior; that is, dialogue precedes self-direction, which in turn precedes internalized thought.

Research on Topography

Recently Kohlberg, Yaeger, and Hjertholm (1968) have reviewed the relevant research on egocentric speech. They combined Vygotsky's, Piaget's, and Mead's points of agreement and disagreement

to come up with four assumptions regarding egocentric speech. Egocentric speech has developmental significance and therefore (a) it is particular to a specific age-developmental period; (b) it has functional and situational determinants; (c) it has limited and distinctive forms; and (d) it reflects the child's inability to differentiate his own perceptions from those of others. The rest of this review will be directed toward these four assumptions, i.e., the variables of age and other intrapersonal variables and situational variables which affect occurrence and form of private speech.

1. Age and Other Intrapersonal Variables

All of the studies report age-development trends with regard to egocentric speech. Piaget (1926) found egocentric speech to comprise 40-70% of the 5-6 year olds' speech in spontaneous conversations. That children ages 3-7 show frequent private speech has been supported by naturalistic observations of children both in group situations (Katz and Katz, 1921; Smith, 1935; Vygotsky, 1962; Meichenbaum and Goodman, 1971) and when alone (Klein, 1963; Weir, 1962). Flavell et al. (1966) studied the spontaneous use of private speech during a task. They discovered an increase from kindergarten to 5th grade in task-relevant use of private speech. They also suggested some support for internalization of egocentric speech, in

that 25% of the 5th graders reported using "inner speech" whereas none of the kindergarteners did so. Age increases in the spontaneous use of private speech have also been found by Gratch (1966) and Jensen (1963); and increases in covertness of private speech were supported by Gratch.

Cognitive development as reflected in IQ and MA may be strongly related to the development and decline of egocentric speech. Kohlberg et al. (1968) suggested that children with high IQs would show a peak in egocentric speech earlier than would children with average IQs. Supporting their hypothesis they found a decrease in egocentric speech between ages 4-6. They also found a significant interaction between age, IQ, and percentage of egocentric speech. This was reflected in a greater percentage of egocentric speech by bright 4 year olds than by average 4 year olds, and less egocentric speech by bright 6 year old Ss as compared with average 6 year old Ss. The authors interpreted this finding in support of Vygotsky's hypothesis of a curvilinear relationship between cognitive development and private speech. Egocentric speech increases with intellectual ability until such development leads to internalized private speech. The bright 4 year olds had already displayed a peak in egocentric speech and showed a steady decline thereafter. The average Ss showed an increase in egocentric speech from 4-5 and a decrease thereafter. The peak for each group occurred at a comparable

mental age, suggesting that cognitive development as opposed to other maturational and learning changes accounted for the curvilinear relationship.

The difficulty with interpreting Kohlberg et al.'s (1968) results is that only the average Ss showed a curvilinear relationship between age and egocentric speech. The authors suggested that the private speech of the bright 4 year olds had already reached its peak and was thus on the decline. In order to establish that a curvilinear relationship actually exists for the bright children a sample of younger Ss should have been used.

Impulsivity-reflectivity has also been examined with regard to private speech. Meichenbaum and Goodman (in press) observed preschool children in a naturalistic setting. They differentiated between reflective and impulsive children using Kagan's (1966) Matching Familiar Figures Test and matched the two groups on IQ. Kagan's measure differentiates between children who decide carefully and slowly when a number of response alternatives are simultaneously available and those who decide quickly with a high number of errors. They found that impulsive children had twice as much egocentric speech as did reflective children (24% vs. 12%). The quality or function of the private speech also differed between the two groups with impulsive children using more self-stimulating private speech and the reflective group using more self-guiding

private speech. This finding lends some support to Vygotsky's hypothesis that the role of private speech is self-guidance.

One interpersonal variable which has not yet been related to private speech is the child's level of verbal regulation. If private speech serves a cognitive, self-regulating function, as Vygotsky (1962) and Luria (1961) have suggested, than clearly a measure of the child's ability to regulate his own behavior should correlate with the child's private speech. The two aspects of verbal regulation which have been measured are the child's ability to follow a series of commands (excitatory control) and the child's ability to stop himself from performing a response (inhibitory control). Presumably young children (less than five) have greater difficulty inhibiting a response than following a command (Luria, 1961; Strommen, 1972). It may be that inhibiting a response involves greater self-regulation than does following a command. Strommen (1972) used the game of "Simon Says" as a measure of self-regulation and found a developmental trend in the ability to inhibit a response, although she did not find such a trend in ability to follow a simple command. However, ability to follow a more complex command may show some relationship to chronological age (CA).

2. Forms or Categories of Egocentric Speech

Luria's (1961) studies have pointed to some developmental qualitative changes in private speech. With age the child becomes more capable of using private speech to guide or discriminate alternatives and to plan action. Supporting studies by Traugott (1959) and Gon Kova (1960) showed that children ages six and seven use verbalizations to plan action whereas children three and four only verbalize in accompaniment or following action. Flavell's work (Flavell, Beach, and Chinsky, 1966; Keeney, Canizzo, and Flavell, 1967) further supports increased self-guiding private speech and internalization of private speech with age. However, Flavell also reported that much private speech of the child appears unrelated to either social or cognitive function (Flavell, 1966; Flavell et al., 1968). This was supported by Weir (1962) and Klein (1963) who suggested that some private speech serves cognitive self-guidance and some serves the function of affective expression.

Klein (1963) reported several categories of private speech in children ages three through seven. He found that the frequency of private speech did not change with age; however, the nature of private speech showed developmental changes. Audible-comprehensible (not task related) speech declined with age ($r = -.44$), inaudible muttering increased with age ($r = .26$), and task relevant

comprehensible speech increased with age (r = .38). Thus, private speech became more covert and more task oriented.

Kohlberg et al. (1968) systematized the categories of private speech and arrived at a developmental hierarchy based on Luria, Vygotsky, and Mead which assumes an increasing self-directing function of private speech and increasing internalization. These categories are as follows:

Level I Presocial Self-stimulating Language

1. Word play and repetition--repeating words for own sake (Ex. "Whats a, whats a, dooodooodoo.)

Level II Outward-directed Private Speech

2. Remarks addressed to non-human objects (Ex. "Get back there." addressed to a piece of sticky paper.)

3. Describing own activity--Remarks about own activity which communicate no information to the listener not apparent from watching him, that is, describing aspects of the self's activity which are visible to the other person whose attention does not need to be directed to it. The description is in a form which has no task-solving relevance or planning function.

It is present rather than past tense; Ex. Piaget's "collective monologue."

Level III Inward-directed or Self-Guiding Private Speech

4. Questions answered by the self--for ex. "Do you know why we wanted to do that? Because I need it to go a different way."

5. Self-guiding Comments--"The wheels go here. We need to start it all over again." (Somewhat similar to Piaget's (1926) category of monologue. "The child talks to himself as though he were thinking aloud. He does not address anyone.") The difference between this category and 3--Describing own activity--is that these comments are task or goal oriented. Speech precedes and controls activity rather than follows it. Such speech often involves cognitive analysis or inferring, for example, reasons for action, analysis of the situation, or reference to nonvisible aspects of the activity.

Level IV External Manifestations of Inner Speech

6. Inaudible muttering--statements uttered in such a low voice that they are not decipherable to an auditor close by.

Level V Silent Inner Speech or Thought

Kohlberg et al. (1968) studied changes in the above categories of egocentric speech across ages five through nine. Using a Guttman scale, they found support for the hierarchy of developmental categories of private speech. Following their predictions "audible muttering" increased regularly with the highest incidence at ages eight and nine. "Self-guiding speech" was the next highest form with a curvilinear relationship, first replacing other forms around age six and then being replaced by muttering. "Self-answered questions" were infrequently used by these Ss. The authors interpreted this as casting doubt on its importance in the shift from private to internal speech. Other infrequently used categories were "commanding objects" and "self-stimulation." "Describing own activity" steadily declined from age five to age nine.

There are several difficulties with this research. First of all in order to better understand the total development of egocentric speech younger children would be needed. This is particularly true for the categories "self-stimulation" and "commanding

objects." However, it may also be true for "self-answered questions," i.e. the authors' interpretation of this as an unimportant category may be incorrect and it may be that developmentally this is a lower form of egocentric speech. Therefore, the present study used younger Ss.

The authors mentioned another difficulty in this research; the raters had difficulty distinguishing the categories "describing own activity" from "self-guiding comments." It appears that this may be a methodological problem in that the rating was done from auditory tapes which would fail to provide information as to when in the sequence of action the verbalization occurred. This was remedied in the current study by the use of video-tapes rather than audio-tapes.

3. Situational Variables

Piaget's and Vygotsky's theoretical frameworks lead to opposite predictions about the effect of situational variables on the occurrence of egocentric speech. The variables studied so far have been (a) the presence of others, and (b) activity or task.

Presence of Others

Piaget's formulation of the situational circumstances fostering high occurrence of egocentric speech was based on his belief that the decline of egocentric speech is dependent upon social interaction with peers. Therefore, he hypothesized that more egocentric speech would occur with adults and less with peers. Vygotsky hypothesized that since young children have difficulty differentiating self as listener from other as listener that there should be more private speech when the distinction between self and other is most difficult, i.e. when the child is with peers. Vygotsky (1962) found support for this hypothesis with experimental manipulations in which he found egocentric speech to decline in situations where the possibility of social interaction decreased. These situations included placing the child with deaf children, with children who spoke another language, or in a room where intruding noise prevented verbal communication.

Kohlberg et al. (1968) did not find support for Piaget's idea that there is a negative correlation between social participation and egocentric speech. After partialling out the effect of age, the correlation between social participation and egocentric speech was $r = .01$; the correlation between social and egocentric speech was a positive $r = .68$. Kohlberg et al. did find some support for

Vygotsky's hypothesis. They found much more egocentric speech in a free play situation with peers (32%) than in a task situation with a minimally responsive adult (18%). Katz and Katz (1928) and Smith (1935) also found high incidence of egocentric speech in a free play situation and Davis (1937) and McCarthy (1930) reported very little egocentric speech in a task situation with a responsive adult (2-3%).

These findings support Vygotsky's hypothesis that private speech occurs most with peers (when there is maximal awareness of similarity with those around) as opposed to heightened private speech with adults as Piaget hypothesized (1926). However, the comparisons which suggest this support are between studies; i.e. these factors have not been examined systematically within one study. Conditions other than presence of peers vs. adults are confounded within and between these studies, i.e. a familiar vs. an unfamiliar setting, task orientation, familiar vs. unfamiliar adults or children. The current study remedied this problem by controlling for these confounding variables.

Activity Variables

Kohlberg et al. (1963) found evidence to support the Vygotsky-Luria (1930) hypothesis that increasing task difficulty

produces more private speech. Further, they found that cognitive difficulty as opposed to perceptual motor difficulty accounted for the increase in verbalization. Looking at the effect of task on private speech categories, they found that "self-guidance" and "self-answered questions" increased with task difficulty and as these increased, inaudible muttering decreased. Kohlberg did not report what effect private speech had on performance on the task, which from a cognitive-development point of view, would be a worthwhile investigation. Klein (1963) reported that children who completed a task successfully produced twice as many task-relevant speech units as did those who failed to do so, although they did not differ in amount of task-irrelevant speech.

Meichenbaum and Goodman (in press) and Meichenbaum (1971) observed private speech of impulsive and reflective children ages 4-5 in a free play and in a specific task in which the child worked alone but in the presence of other children. The tasks were painting, stringing beads, and puzzles. Impulsives' private speech was predominantly Level I--Self-stimulation and it did not decrease in the specific task situation. The reflectives spoke significantly more at higher levels of speech (outer-directed, self-regulatory, and inaudible mutterings). Reflectives were also more responsive to the situational change; self-guiding private speech increased from 11% in a free play to 25% in the task situation. These results,

as well as results in a Luria-type task (Bates and Katz, 1970), suggest that impulsive children have less verbal control over motor behavior and use private speech less to control or direct their behavior than do reflective children. Also, the task affects the amount and form of private speech only in reflective children.

AIMS AND HYPOTHESES OF THE PRESENT STUDY

The aim of the present study was to elucidate the topography and function of egocentric speech and to replicate and clarify the findings reported in the review of literature. Further, an attempt was made to examine the common assumptions and points of difference between the two major theorists on egocentric speech, Vygotsky and Piaget. The major questions for study were:

A. What cognitive-developmental and intrapersonal characteristics of the child influence the amount and form of private speech he displays?

This question, answered partially by some of the previously mentioned studies, leads to the following empirical hypotheses:

1. Age is a regular and major determinant of the frequency and type of egocentric speech. Egocentric speech should show a curvilinear relationship with CA rather than a monotonically decreasing function as postulated by Piaget: a) 2 1/2-4 year old children should show less of all types of private speech than the 4-5 1/2 year old children but more than the 6-8 year old children (Vygotsky, 1962), b) 2 1/2-4 year

olds should display more of the lower levels of private speech (Self-stimulating and Outer-directed) than children over 4 years old (Kohlberg, et al., 1968; Klein, 1963), c) children over 5 1/2 years old should display more of the higher levels of private speech (Inner-directed and Muttering) than children less than 5 1/2 (Kohlberg et al., 1968; Luria, 1961; Traugott, 1959; Gon Kova, 1960; Flavell, Beach, and Chinsky, 1966; Keeney, Cannizzo, and Flavell, 1967; Klein, 1963).

2. Cognitive development as reflected in IQ and MA should be strongly related to the development and decline of private speech: a) The peak for total egocentric speech should occur at approximately MA = 5, b) after MA = 5 lower levels of private speech should decrease while higher levels of private speech should increase (Kohlberg et al., 1968).

3. Impulsivity-reflectivity should effect amount and form of private speech: a) impulsive children should use more Outer-directed private speech and more self-stimulating speech, b) the reflectives should use more Inner-directed speech (Meichenbaum and Goodman, in press).

4. If private speech comes to serve a cognitive self-regulating function, as Vygotsky (1962) and Luria (1961) have suggested, then the child's ability to regulate his own behavior and his success in sticking with a task should be correlated with the child's level of private speech: a) the child's ability to follow a series of commands (excitatory control) should be positively correlated with Inner-directed private speech and negatively related to Self-stimulation and Outer-directed speech, b) the child's ability to inhibit or stop a response should be positively correlated with Inner-directed private speech and negatively related to Self-stimulating and Outer-directed speech, c) children who are able to stay with a task and complete it successfully, particularly when this involves inhibiting strong competing responses, should use less self-stimulating of Outer-directed private speech and more Inner-directed task-relevant speech (Klein, 1963).

5. Since young females have been found to be more verbal than young males (Davis, 1937) there may be a difference in amount and type of private speech depending upon sex. However, since no studies have examined this effect there is no basis for predicting the direction of the effect.

B. The intrapersonal variables measured should relate, not only to private speech, but also to one another. It is unlikely that each measure is pure, in that they probably share common factors. A prediction of the strength and direction of the intercorrelations may be derived from the theoretical analysis of Luria (1961) and White (1965).

1. MA, CA, Self-control (both excitatory and inhibitory) persistence and success at a task should all show strong, positive intercorrelations and a negative correlation with impulsivity.

2. IQs should show the same trends, though less strongly.

C. Is Vygotsky correct in his assumption that private speech is most likely to occur when the child is with a peer who is maximally like the child, as opposed to Piaget's assumption that private speech is least likely to occur when the child is with a peer with whom the child needs to decenter in order to cooperate?

This question raises the following hypotheses:

1. More private speech of all forms should occur in the presence of a familiar child than in the presence of a familiar adult (Kohlberg et al., 1968; Katz and Katz, 1928; Smith, 1935; Davis, 1937; McCarthy, 1930).

2. If young children are more egocentric--involved in their own world (Piaget, 1963) private speech should be less influenced

by the person present for younger children than for older children (i.e., there should be an interaction between age and person present).

D. Is Vygotsky correct in his assumption that private speech develops with a cognitive, task-solving function as opposed to Piaget's assumption that it is merely a presocial form of speech which is socialized out of the child?

This question raises the following hypotheses:

1. Activity in which the child is engaged should have a strong differential effect on the type of speech he displays: a) higher levels of private speech (Inner-directed and Inaudible Muttering) should be greater during a structured, difficult task than during freeplay, b) lower levels of private speech (Self-stimulation and Outer-directed speech) should be greater during free play than during a structured, difficult task (Kohlberg et al., 1968).

2. Younger children in the two activities should show much less differentiation in their private speech (both higher and lower levels) and social speech than do older children (i.e., there should be an interaction between Age and Activity).

E. Does egocentric speech represent a unitary concept in which all types of speech increase and decrease in a common pattern or are the different forms actually different in their occurrence depending upon other variables?

This question suggests two hypotheses:

1. If the forms of egocentric speech reflect the child's level of cognitive-development (and other intrapersonal variables) there should be a relatively high positive correlation between the same forms across situations.

2. If each level of egocentric speech differs from each other level then they should each differ systematically in patterns of occurrence dependent upon intrapersonal and situational variables. Categories of speech which fall in the same level should show systematic similarities in their patterns of occurrence.

METHOD

Subjects

Twenty subjects--10 male and 10 female--in each of three age groups--2 1/2-4, 4-5 1/2, 6-8--were secured through the Michigan State University Married Students Association (MSUA) Day Care Center and Michigan State University Married Housing. The youngest Ss were judged to be "verbal" by the day care teacher and E during an observation of the children. The criterion for being considered "verbal" was observed ability to speak in 3-4 word sentences. Bilingual children were not included in the study. All subjects were children of students at the university.

Parents were contacted by letter (see Appendix A) and by phone to enlist their cooperation. All but four were anxious to have their child participate.

Procedure

In order to insure cooperation during the first session, the Es (2 male and 1 female) spent 6 hours each at the day care center getting to know the children.

Each subject was then brought by his parents to a small conference room at Michigan State University for a total of three separate sessions. The room was a 10 x 14 carpeted room, equipped with microphones, a one-way mirror (which could be blocked by curtains) and 2 small windows (1-1/2' x 1-1/2') which permitted video-taping of the last two sessions. The adjoining observation room housed the Ampex 6100 video-tape recorder, the 2 Ampex cameras, the sound equipment and a console permitting split screen recording.

Before each session the child was allowed to select a trinket from a toy tray. This period was used as a warm-up period to allow the child to become familiar with the surroundings and E.

Session 1

The first session was to adapt S to the room and to administer the test measures for the intrapersonal variables.

The S and his parents were greeted by E. S was told, "Today we will be playing some games together in this special room for children. Your Mom (and/or Dad) will be waiting for us in the waiting room." The child was then seated at a small table and allowed to play with some cardboard farm animals. The parents were directed to the observation room to watch the test session. Usually one of the Es observed with the parents to explain the procedure

and answer any questions. A brief period of about five minutes was used by E to get to know S and put him at ease. (For two of the youngest Ss the mother was present in the room during the first session.) Then E administered the test measures. Total testing time ranged from 25-60 minutes with the youngest children taking the longest time to complete the battery of tests. Children who became restless were encouraged to continue but testing was terminated if the child showed signs of fatigue. The child was then joined by his parents and told, "You will be coming back two more times."

Sessions 2 and 3--The Video-taped Sessions

The second and third visits to the conference room were either with a parent or with a same sex, same age classmate with whom the child was good friends. Peer-parent and parent-peer visits were counterbalanced within groups. Using mothers and classmates for the adult and peer effects on egocentric speech was an attempt to control familiarity. Of course the author was aware that children are more familiar with their mothers than with their peers; however, the attempt here was to encourage speech. It was suspected that novel stimuli of any kind, especially new people, would tend to inhibit any speech, particularly in the younger Ss.

The parent and peer sessions were each divided into two 10 minute sessions. One session was free play; the other session was "cognitive" tasks. The order of free play and tasks was counterbalanced within groups. During free play S was seated at a small desk with two shelves. Toys were arranged on the shelves. The toys included: three PlaySkool people, three pieces of doll furniture, Play-doh Modeling Compound, a toy telephone, a play car, and a crow hand puppet. During tasks the desk was turned so that the toy shelves were out of S's sight. Two tasks were used: five minutes for puzzles and five minutes for coloring. S was presented with two puzzles: one hard, the other easy. The easy puzzle had fewer pieces and was presented to S assembled; the hard puzzle had more pieces and was presented to S disassembled. The type of puzzle used depended upon the age of the child (see Appendix B). The easy puzzle was assessed at a difficulty level below the child's age by the manufacturer; the hard puzzle was assessed at a difficulty level at or above the child's age by the manufacturer. After working on the puzzles for 5 minutes, S was presented with a large roll of paper and a box of crayons and allowed to color for 5 minutes.

The parent session began with instructions to the child and the mother. S and Mother (M) were directed into the play room and told, "Today you will be in the conference room for 20 minutes to

play some games. S, here is your special seat and desk, and here is your mother's desk." S was seated at his desk and M was seated at her desk. M's desk was on S's right about four feet away. Both M and S faced the end of the room where the camera windows were situated. E spoke to S, "See S, here are some toys for you to play with. You may play with any of the toys you like for 10 minutes, then I'll come back with some other games. Your Mom is working on a questionnaire. You work on your things and let your Mom work on her things." Then E spoke to M, "Here is a questionnaire that I'd like to have you fill out; it's about your interaction with S. Try not to interfere with what your child is doing. Generally ignore him, but if he asks a direct question go ahead and answer and direct him back to his activity." Then E spoke to both, "I'll be back in 10 minutes; have fun." Ten minutes later E returned with two puzzles. E spoke to S, "Now I would like for you to do two puzzles for me." E placed the two puzzles in a row on the table. "This first one is the easiest, the second is harder. I'd like you to do this one first" (pointing to the easiest), "and then as much of the rest as you have time to do. You may work on these for 5 minutes" (E then removed pieces from easy puzzle) "then I will bring you some paper and crayons to draw. Work on these alone and let your Mom work on her questionnaire. I will be back in five minutes." E left the room and returned in five minutes. E presented S with a large

roll of paper; you may rip off as much as you like to draw a picture. I will be back in five minutes." E returned, thanked S and M and terminated the session.

The peer session began with instructions to both Ss. Each child was seated at his own desk. The desks were about four feet apart, each facing the end of the room where the camera windows were situated. The instructions given S were the same as those given during the parent session except that during free play they were told, "Each of you has your own desk, so play by yourselves so that each one can do just what he wants." For the tasks they were told, "You each have your own puzzles; work on them alone so that you can each do it alone"; for the coloring they were told, "Each of you has your own crayons; each work on your own picture so you can take it home when you're done."

Both Parent and Peer sessions were video-taped for later analysis.

Test Measures

A battery of five tests was given to all Ss individually during session 1. Several measures were derived from each test. Table 1 shows the range, mean, and standard deviation of the scores.

IQ, MA

Measurement of cognitive development--Mental Age (MA) and IQ--were derived from the Peabody Picture Vocabulary Test, Form B (Dunn, 1965). The test was administered in the standard way, according to the instructions in the manual.

Impulsivity

Measures of impulsivity were taken in two ways.

a) The Picture Absurdities sub-test from the Detroit Test of Learning Aptitude (Baker and Leland, 1967) was administered to each S. Ss were instructed: "I have some pictures here. Some of them have something foolish about them--something silly. You tell me each time what is foolish; what is silly about the picture." Eighteen pictures (ranging in difficulty) were presented to S. (See Appendix C.) The test was scored following Kagan's scoring technique for differentiating impulsive from reflective children (Kagan, Rosman, Day, Albert, and Phillips, 1964). Number completed, number correct and reaction time on correct trials, errors and reaction time on error trials were all recorded.

b) The second measure of impulsivity was a game called Eggs to Market. This game was used by Stevenson and his associates to measure impulsivity (Friedricks, Hertz, Moynahan, Simpson, Arnold,

Christy, Cooper, and Stevenson, 1971). In this game E showed S a small truck containing "eggs" and a 29 inch road and told him: "In this game we are going to deliver eggs to the grocery store. We have a truck that is filled with eggs, and a road that leads to the store. I want you to drive the truck from this end of the road to the store at the other end. You must go very slowly so that the eggs don't break. Remember, try to go as slowly as you can so the eggs do not break. Begin." E timed S. The score was the amount of time taken to push the truck to the other end of the track.

Self-control--Excitatory

Ability to follow commands or excitatory self-control was assessed by the Farm Game (Friedrichs et al., 1971). S was shown a flannel board on which was pasted a house, a barn, a shade tree, and a fence. The task was introduced as the Farm Game, and S was shown the flannel board cut-outs with which he would play the game (Farmer Jones, his truck, a tractor, pigs, a cow, a dog, and a bushel of apples). These pieces were placed along the edge of the table in front of S and named by E. S was then instructed, "Listen carefully and do just what I say." Two sample directions were given, and S was corrected if he made an error. Then S was asked

to carry out seven sets of directions. The directions (see Appendix D) ranged from simple (e.g., "Put Farmer Jones by the house.") to complex (e.g., "Drive the tractor to the big shade tree. Put the dog by the barn. Drive the truck to the big house. Put the apples by the fence."). The directions differed both in number of elements and in the degree to which they were interrelated. The subject was required to listen to a complete set of directions before carrying out any of its components. A total of 32 points, one for each component, was possible.

Self-control--Inhibitory

Ability to stop a response was measured in the game "Simon Says" (Strommen, 1972). To insure that the child understood the ten actions used during the game, E introduced the actions as exercises and E and S did them together (e.g., "Touch your tummy; wave your hand; stamp your feet; touch your nose; put arms up; touch your knee; put hands on head; step forward; step back; touch the floor"). The game was played two ways--a) with a signal to inhibit the response and b) without a signal to inhibit the response. It was assumed that responding with a signal would be easier than responding without a signal.

a) For the game with a signal, E gave the following instructions: "In this game I'll do all the exercises. Sometimes you do them with me and sometimes you don't. If I say 'Simon Says,' you do them; but, if I say 'Mickey Says,' you don't do them. What would you do if I said, 'Simon says clap your hands?'" (The child indicated comprehension of the instructions by performing the action or by describing what he would do.) "But what if I said, 'Mickey says clap your hands,' what would you do?" (The child indicated comprehension by not performing the action or by explaining what he would do.) If the child made an error the instructions were repeated and another test trial was given using "Touch your ear," as an example. If the child did not demonstrate understanding of the instructions the task was terminated. Ss were scored for number of errors on the "Simon Says" trials and number of errors on the "Mickey Says" trials (Inhibition). Only the inhibition errors were analyzed; a score of five errors was possible.

b) For the game without a signal, E said, "Now we are going to change the game a little. Mickey left and now only Simon is here. Now, if I say Simon Says, you still do the exercises, but if I don't say Simon Says, you don't do them. For example, if I said, 'Simon says clap your hands,' what would you do?" (The child responded.) As in the previous game only children who demonstrated understanding of the instructions were included in the analysis.

Ss were scored for number of errors on the "Simon Says" trials and the "no-Simon Says" trials (inhibition). Only the inhibition errors were analyzed; a score of five was possible.

Coding Egocentric Speech

Two raters unaware of the hypotheses were trained by the investigator to identify the 6 categories of private speech and social speech as outlined in the Kohlberg et al. (1968) article (see Appendix E for complete definitions of categories). During training raters identified the categories of private speech as they viewed pilot video-tapes. Training continued until inter-rater reliability reached at least .90. A check on inter-rater reliability between the investigator and the raters were conducted on the overall reliability of the rating during the actual ratings and was $r = .92$. Two raters viewed each video-tape. Any disagreement in rating was completely discussed and that segment of the tape viewed repeatedly until agreement could be reached. The rating of any unusual utterances or difficult-to-rate speech was noted so that raters could be consistent throughout the weeks of rating.

RESULTS

The private and social speech data were analyzed in seven 2x2x3x2x2 nested-factorial analyses of variance (Winer, 1962) to analyze the effects of Order of session (mother-peer, peer-mother), Sex, Age (2-1/2-4, 4-5-1/2, 6-8), Person present (mother, peer), and Activity (task, free play). The dependent variables were the 6 types of egocentric speech and social speech. The egocentric speech was divided in the following way: Level I--1. Self-stimulating; Level II--Outer-directed private speech--2. Commanding objects, 3. Describing own activity; Level III--Inward-directed private speech--4. Dialog, 5. Self-guiding comments; Level IV--6. Inaudible muttering. (See Appendix F for all ANOVA results.) For clear exposition the data will be reported by variable rather than by each ANOVA table.

The intrapersonal variables were analyzed by a correlation matrix. The range, mean, and standard deviation of scores is reported in Table 1. For the correlations private speech was collapsed into 3 categories--Self-stimulation, Outer-directed (Commanding objects and Describing activity) and Inner-directed (Dialog,

TABLE 1

MEAN, RANGE, AND STANDARD DEVIATION OF SCORES ON THE INTRAPERSONAL VARIABLES

Variables	Mean	Range	Standard Deviation
CA (mos.)	59	35-98	16.8
MA (mos.)	73	27-124	24.1
IQ	113	68-144	14.9
Impulsivity			
Eggs	22.2	3-117	23.6
Number Correct (PA)	5.5	0-14	3.3
RT/Correct (PA) (sec.)	41.9	0-92	21.0
Errors (PA)	12	4-18	3.2
RT/Errors (PA) (sec.)	57	10-191	34.5
Self-Control			
Number Correct (FG)	24.8	13-32	4.4
Inhibit I errors	1.7	0-5	2.2
Inhibit II errors	2.3	0-5	2.2
Persistence and Success			
Success/mother[1]	5.1	0-21	5.3
Success/friend[1]	4.5	0-22	4.9

[1]Score is number of puzzle pieces completed.

Self-guidance and Muttering). These categories were analyzed within the two Activity conditions--free play and tasks. Only correlations of private speech during tasks are reported because generally the correlations follow the same trend in both tasks and free play with private speech during tasks showing the most sensitivity to intrapersonal variables (i.e., correlations between private speech and the intrapersonal variables during free play were generally smaller). Further, the relationships between private speech and the intrapersonal variables derived under the free play condition were of less theoretical interest than were those derived under the tasks condition. (See Appendix G for complete correlation matrix.)

Age

The first concern was to analyze age effects on egocentric speech. The hypotheses relating to age were partially supported as can be seen in Table 2. The curvilinear relationship predicted by Vygotsky and Kohlberg was not found even though younger subjects were used in this study. All curves were monotonic, supporting Piaget's hypothesis. As predicted, younger Ss showed a significantly greater amount of Outer-directed private speech (Commanding objects and Describing activity) than did older Ss. Further

TABLE 2

MEAN FREQUENCIES OF THE 6 CATEGORIES OF EGOCENTRIC AND SOCIAL SPEECH FOR THE 3 AGE GROUPS*

Categories of Speech	Age Groups			F	df	P
	2 1/2-4	4-5 1/2	6-8			
Level I Presocial-Self-Stimulating						
1. Repetition and Word Play	7.5	7.2	5.8			N.S.
Level II Outward Directed						
2. Commanding Objects	5.5	5.2	3.0	4.5	2/48	.05
3. Describing Activity	13.9	12.2	7.2	9.0	2/48	.001
Level III Inward Directed						
4. Dialog	3.8	4.0	3.4			N.S.
5. Self-Guiding	9.0	9.3	9.7			N.S.
Level IV External Manifestations of Inner Speech						
6. Inaudible Muttering	1.1	2.0	2.3	5.0	2/48	.01
Social Speech	9.8	10.7	11.6			N.S.

*For complete ANOVA Tables see Appendix F.

support for the hypothesis that the course of change is a monotonic decreasing function comes from the significant correlation between CA and Outer-directed private speech, $r = -.56$. Level I, Self-stimulating speech, and Inner-directed speech (Dialog and Self-guiding) did not show a significant increase over age, but rather, stayed about the same over ages ($r = -.13$ and $r = .04$, respectively). As predicted, Inaudible muttering showed a significant change over age, indicating that private speech may be internalizing as Vygotsky suggested. Social Speech stayed about the same across all ages ($r = -.15$).

MA and IQ

The next concern was to analyze the relationship between cognitive development (MA and IQ) and private speech. As with CA there appeared to be a monotonic decreasing relationship between MA and Outer-directed private speech ($r = -.55$, $p < .001$) and IQ and Outer-directed private speech ($r = -.27$, $p < .05$). Self-stimulating speech and Inner-directed private speech showed no significant relationship to MA or IQ. This indicates that increasing cognitive development does accompany a decrease in the lower level--Outer-directed private speech--but does not affect the

higher levels of private speech, at least in a sample of ages 2 1/2-8, and as measured in this study.

In order to see whether the low correlation between MA and higher levels of private speech was due to a curvilinear relationship with a peak of private speech at MA = 5, the sample was divided into Ss with MA's greater than five (N = 37) and MA's less than five (N = 23). Table 3 shows the intercorrelations.

TABLE 3

CORRELATIONS BETWEEN MA AND 2 LEVELS OF PRIVATE SPEECH (MEASURED DURING TASKS) FOR SS WITH MA LESS THAN 5 AND MA GREATER THAN 5

	Outer-directed speech			Inner-directed speech		
	M	sd	r	M	sd	r
MA less than 5	35.4	14.7	-.29	35.4	16.5	.22
MA greater than 5	21.6	13.1	-.42	31.3	13.8	-.24

The correlation coefficients indicate that Outer-directed private speech does not have a peak at MA = 5, but rather is a monotonically decreasing function. However, there does appear to be a change in the slope of the curve at about MA = 5 as shown by the larger correlation for MA greater than 5. Although neither of the correlations

between MA and Inner-directed speech are significant, the change from a positive correlation for MA's less than 5 to a negative correlation for MA's greater than 5 is the first indication of a curvilinear relationship between MA and private speech. It may be that with a larger age range, these correlations would be significant.

Impulsivity

The relationship between impulsivity and private speech was examined next. Correlations in Table 4 show that the measures of impulsivity themselves measure slightly different aspects of impulsivity (or have large amounts of error variance). Number of pictures correct on the Picture Absurdities task was a more sensitive measure than number of errors. This is because some children became restless before the full 18 pictures were completed. These children had few errors because they attempted few of the pictures. Restlessness during the task could be a measure of impulsivity.

Impulsive children were defined as those who had low scores on the Eggs game and during Picture Absurdities received fewer correct, made more errors and had low reaction times.

As can be seen from Table 5, the prediction that impulsivity should be related to private speech was partially supported for

TABLE 4

CORRELATIONS BETWEEN MEASURES OF IMPULSIVITY INCLUDING EGGS GAME, PICTURE ABSURDITIES GAME (PA): NUMBER CORRECT, REACTION TIME (RT) FOR CORRECT, ERRORS AND RT FOR ERRORS

	Eggs	Picture Absurdities (PA)		
	No. Correct	RT/correct	Errors	RT/errors
Eggs --	.36**	.06	-.26*	.23
Number correct (PA)	--	.05	-.81***	.42***
RT/correct (PA)		--	-.15	.58***
Errors (PA)			--	-.37**
RT/errors (PA)				--

*p < .05
**p < .01
***p < .001

TABLE 5

CORRELATIONS BETWEEN MEASURES OF IMPULSIVITY AND FREQUENCY OF 3 LEVELS OF EGOCENTRIC SPEECH

	Egocentric Speech		
	Self-stimulating	Outer-directed	Inner-directed
Eggs	-.17	-.22	-.03
Number correct (PA)	-.23	-.56***	-.02
RT/Number correct (PA)	-.30*	-.00	.13
Errors (PA)	.17	.34**	-.09
RT/Errors (PA)	-.15	-.10	.11

*p < .05
**p < .01
***p < .001

several measures of impulsivity. Only the lower levels of private speech (Self-stimulating and Outer-directed) were related to impulsivity. It appears that impulsive children were more likely to use Self-stimulating speech and Outer-directed speech during the tasks than were more reflective children. However, amount of Inner-directed speech does not seem to be related to impulsivity.

Self-Control--Excitation and Inhibition

The measures of the child's ability to control his behavior in following instructions (excitation) and in stopping a response (inhibition) are shown to correlate highly in Table 6. As expected, the inhibition measures correlate more highly with each other than they do with the excitation measure (i.e., there appear to be differences between excitation self-control and inhibition self-control measures). High self-control is indicated by getting a high number correct on the Farm game (Excitatory), low errors on inhibiting a response in the presence of a signal (Inhibit I), and low errors on inhibition of a response in the absence of a signal (Inhibit II). Table 6 also shows the relationship between the various measures of self-control and private speech. Again the hypotheses were supported for Levels I and II (Self-stimulation and Outer-directed

TABLE 6

INTER-CORRELATIONS BETWEEN SELF-CONTROL MEASURES AND THEIR CORRELATION WITH 3 LEVELS OF EGOCENTRIC SPEECH

	Self-Control Measures		
	Number correct Farm Game (Excitation)	Inhibit I (Errors with signal)	Inhibit II (Errors without signal)
Number correct	--		
Inhibit-I	-.47***	--	
Inhibit-II	-.44**	.83***	--
Categories of egocentric speech			
Level I Self-stimulation	-.11	.24	.36***
Level II Outer-directed	-.33**	.35**	.59***
Level III Inner-directed	.17	.07	.18

*p < .05
**p < .01
***p < .001

speech) but not for the higher Level III--Inner-directed speech. Children with low self-control were more likely to use lower levels of speech during the tasks than were children who were high in self-control. Self-control had little relationship with amount of Inner-directed speech used.

Persistence and Success on Task

Two measures of persistence--remaining at the task with mother (Persist/M) and remaining at the task with friend (Persist/F) and two measures of success--number of puzzle pieces completed with mother (Success/M) and number of puzzle pieces completed with friend (Success/F) were inter-correlated. These measures were then correlated with the 3 levels of egocentric speech measured during tasks. As shown in Table 7, the hypotheses that persistent children would be more successful and display less Level I--Self-stimulating and Level II--Outer-directed speech were confirmed, particularly when the child is persistent with the friend. This may be because remaining at a task with a disruptive friend is a stronger measure of persistence. Success at the task was not correlated with type of egocentric speech and the hypothesis that persistent children would display more Inner-directed speech was not confirmed.

TABLE 7

INTERCORRELATIONS BETWEEN PERSISTENCE AND SUCCESS MEASURES AND THEIR CORRELATIONS WITH 3 LEVELS OF EGOCENTRIC SPEECH

	Persistence and Success Measures			
	Persist/M	Success/M	Persist/F	Success/F
Persist/M	--			
Success/M	.36**	--		
Persist/F	.58***	.34**	--	
Success/F	.26*	.61***	.44***	--
Categories of Egocentric Speech				
Level I Self-stimulation	-.15	-.04	-.35**	-.12
Level II Outer-directed	-.36**	-.05	-.39**	-.11
Level III Inner-directed	.01	.24	-.13	.08

*p < .05
**p < .01
***p < .001

Sex

The main effect of sex on private speech was generally not significant. However, two categories of speech did show a significant effect. Table 8 shows the direction of these effects.

TABLE 8

MEAN FREQUENCY OF CATEGORIES--SELF-STIMULATION AND COMMANDING OBJECTS FOR MALES AND FEMALES

	Male	Female	F	df	P
Self-stimulation	7.9	5.8	4.4	1/48	.05
Commanding Objects	3.8	5.4	4.6	1/48	.05

Males used more self-stimulating speech than did females. This effect was also reflected in the correlation between being male and amount of self-stimulating private speech ($r = .30$, $p < .05$). Females used more Outer-directed--commanding objects than did males. The correlation between being female and Occurrence of Outer-directed speech was not significant.

Pattern of Intrapersonal Variables

The hypothesis that the intrapersonal variables should relate to one another in a predictable manner was strongly supported by these results. Table 9 shows the correlations between measures. To simplify reading the table, only significant correlations are included.

The data in Table 9 indicate that between the ages of 2 1/2-8 increasing age and mental age correspond to a decrease in impulsivity (indicated by an increasing ability to stick with a task and methodically search for the correct answer), an increase in self-control (indicated by increasing ability to follow instructions and inhibit a response), and an increase in persistence and success with a difficult task in the presence of the mother and especially in the presence of a friend. More intelligent children (higher IQ) are somewhat more likely to be low in impulsivity, high in self-control, and high in persistence, but CA and MA are better predictors of these traits.

As expected, impulsive children are likely to be low in self-control and low in persistence and success with a difficult task. Children who are high in self-control are also likely to be persistent and successful with a difficult task.

TABLE 9

SIGNIFICANT CORRELATIONS BETWEEN INTRAPERSONAL VARIABLES: CA, MA, IQ, IMPULSIVITY, SELF-CONTROL (EXCITATION, INHIBITION) PERSISTENCE AND TASK SUCCESS

					Impulsivity					Self-Control			Persistence and Success			
	N[2]	CA	MA	IQ	Eggs[1]	Number Correct[1]	RT Correct[1]	Errors	RT Errors	Number Correct (FG)	Inhibit I[1]	Inhibit II[1]	Persist Mother	Success Mother	Persist Friend	Success Friend
CA	60	--														
MA	59	.83	--													
IQ	59		.69	--												
Impulsivity																
Eggs[1]	58	-.30*	-.33**		--											
Number Correct (PA)[1]	58	-.79	-.76	-.40**	.36**	--										
RT/Correct (PA)[1]	55						--									
Errors (PA)	58	-.67	-.57		.26*	.81		--								
RT/Errors (PA)[1]	58					.42	.58	.37**	--							
Self-Control																
Number Correct (FG)	58	.53	.55	.28*		-.48		-.38		--						
Inhibit I errors[1]	50	.67	.67	.30*		-.69		-.73	-.29*	.47	--					
Inhibit II errors[1]	47	.74	.67		-.37**	-.69		-.68		.44**	.83	--				
Persistence and Success																
Persist/mother	59	.38**	.36**			-.35**				.45		.32*	--			
Success/mother	60									.31*			.36**	--		
Persist/friend	59	.52	.53	.31*		-.44**				.46	.36**	.48	.58	.34**	--	
Success/friend	60		.27*	.28*		-.32**		-.29*					.26*	.61	.44	--

[1]These scores inverted to reflect the direction of the variable name.

[2]Some subjects became fatigued before completing the task, some were not continued due to procedure.

*p < .05
**p < .01
All others significant at p < .001.

Presence of Peer vs. Adult

The next concern was to analyze the effect of presence of other on private speech. As Table 10 shows, generally, Vygotsky's hypothesis that more private speech should occur when the child is with a peer who is maximally like the child was supported. This contradicts Piaget's prediction that private speech would occur more frequently with an adult. The only type of speech which shows a reverse effect is Inaudible mutterings. For this category there was more Inaudible muttering with mother than with friend. It seems that being with a friend fosters more audible self-guiding speech whereas the presence of the mother tends to inhibit such speech leading to more inaudible private speech. That is, as self-guiding speech decreased, inaudible muttering increased. The general inhibiting effect of the mother was especially strong if the child was with mother first (i.e., there was more Inaudible muttering and less Self-guiding speech when the child was with the mother during the first session and with friend the second). This effect is shown by a significant Order x Person effect for Self-guiding speech ($F = 4.1$; df 1, 48; $p < .05$) and for Inaudible muttering ($F = 4.5$; df 1, 48; $p < .05$). (See Appendix H for all significant interaction means.)

TABLE 10

MEAN FREQUENCY OF THE 6 CATEGORIES OF EGOCENTRIC SPEECH WHEN WITH ADULT AND PEER

		Adult	Peer	F	df	P
Level I	Presocial-Self-Stimulating					
	1. Repetition and Word Play	5.3	8.3	26.2	1/48	<.001
Level II	Outer-Directed					
	2. Commanding Objects	3.7	5.4	6.6	1/48	<.01
	3. Describing Activity	8.8	13.4	15.1	1/48	<.001
Level III	Inner-Directed					
	4. Dialog	3.1	4.3	5.4	1/48	<.05
	5. Self-Guiding	6.5	12.1	44.3	1/48	<.001
Level IV	External Manifestation of Inner Speech					
	6. Inaudible Muttering	2.4	1.2	15.6	1/48	<.001

A significant Order x Sex x Person effect on Self-guiding speech indicates that females were more sensitive to the order effect than were males. Females showed the most differential self-guiding comments between friend and mother sessions if the mother was seen first and less difference if the friend was seen first ($F = 4.5$; df 1, 48; $p < .05$). Generally, this reflects less inhibition in a strange situation for males than for females. That is, females talked to themselves less than males did in a new strange situation unless mother was present on the first session.

The effect of presence of other was clarified by several other significant interactions.

The prediction that young children, being more egocentric, should be the least affected by person present and oldest children the most affected by person present was supported by significant interactions between Age and Person for both measures of Level III Inner-directed private speech: Dialog ($F = 15.4$; df 1, 48; $p < .001$) and Self-Guiding speech ($F = 19.1$; df 1, 48; $p < .01$), and by trends for Level II Outer-directed private speech: Commanding objects and Describing activity. The direction of the interaction is shown in Figure 1 for self-guiding comments; other types of speech showed the same interaction. Youngest children showed slightly more Inner-directed comments with mother than with friend, middle and oldest

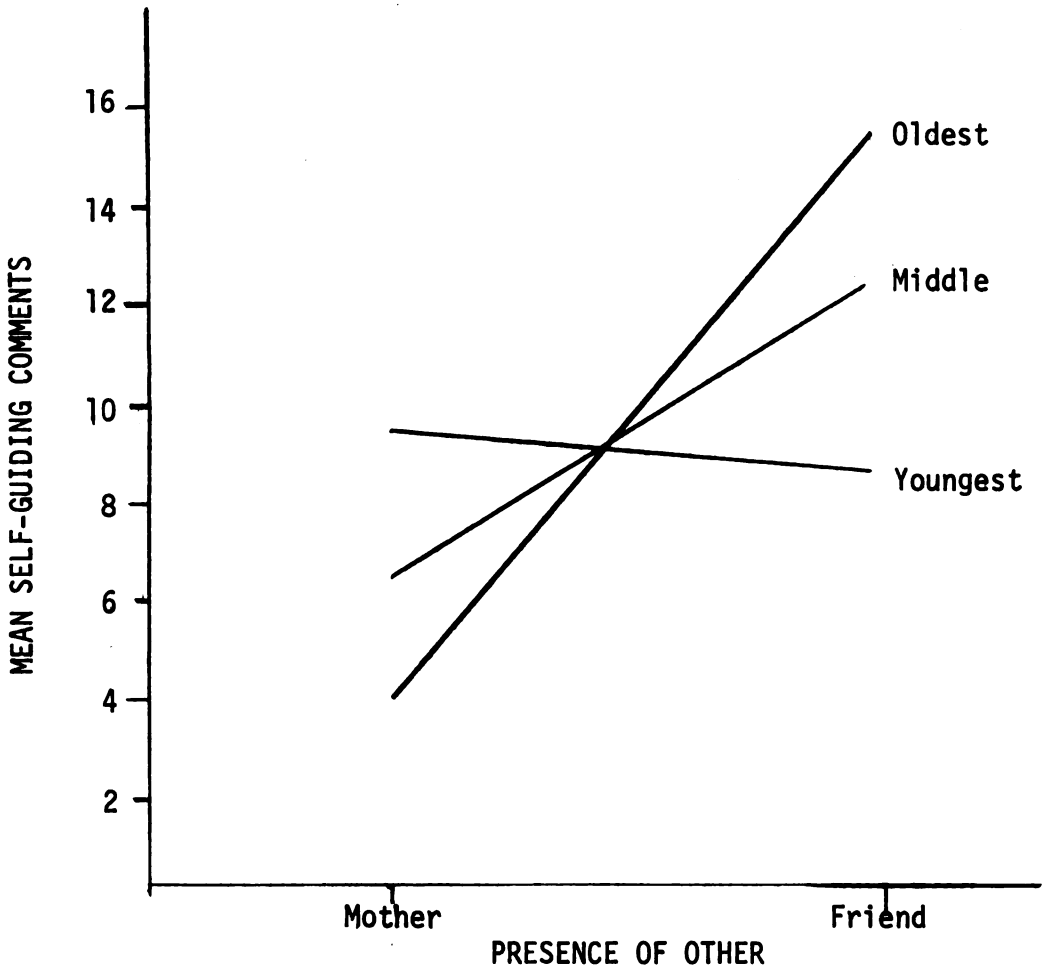

Fig. 1.--Effect of presence of other on amount of self-guiding speech for young (2 1/2-4), middle (4-5 1/2), and old (6-8) children.

y-m	9.45
y-f	8.47
m-m	6.28
m-f	12.30
o-m	3.90
o-f	15.53

children showed more Inner-directed comments with friend than mother with the oldest showing the strongest effect.

Social speech was significantly affected by person present as well. Children generally talked more with friend than with mother ($F = 113.2$; df 1, 48; $p < .001$).

The hypothesis that youngest children are more dependent on mother than are older children, and therefore show comparatively more social speech with mother and less with friend was supported by the significant Age x Person interaction for social speech shown in Figure 2 ($F = 11.7$; df 1, 48; $p < .001$). These differences were slightly attenuated in all age groups if the child was with friend first rather than mother (Order x Age x Person, $F = 3.5$; df 1, 48; $p < .05$). This may be because children would tend to be quieter (more inhibited) in the first session and more talkative in the second. Children were quieter with mother than they were with friend. So, if children were with mother in the first session, this would increase the inclination to be quieter, and being with friend during the second session would increase the inclination to talk.

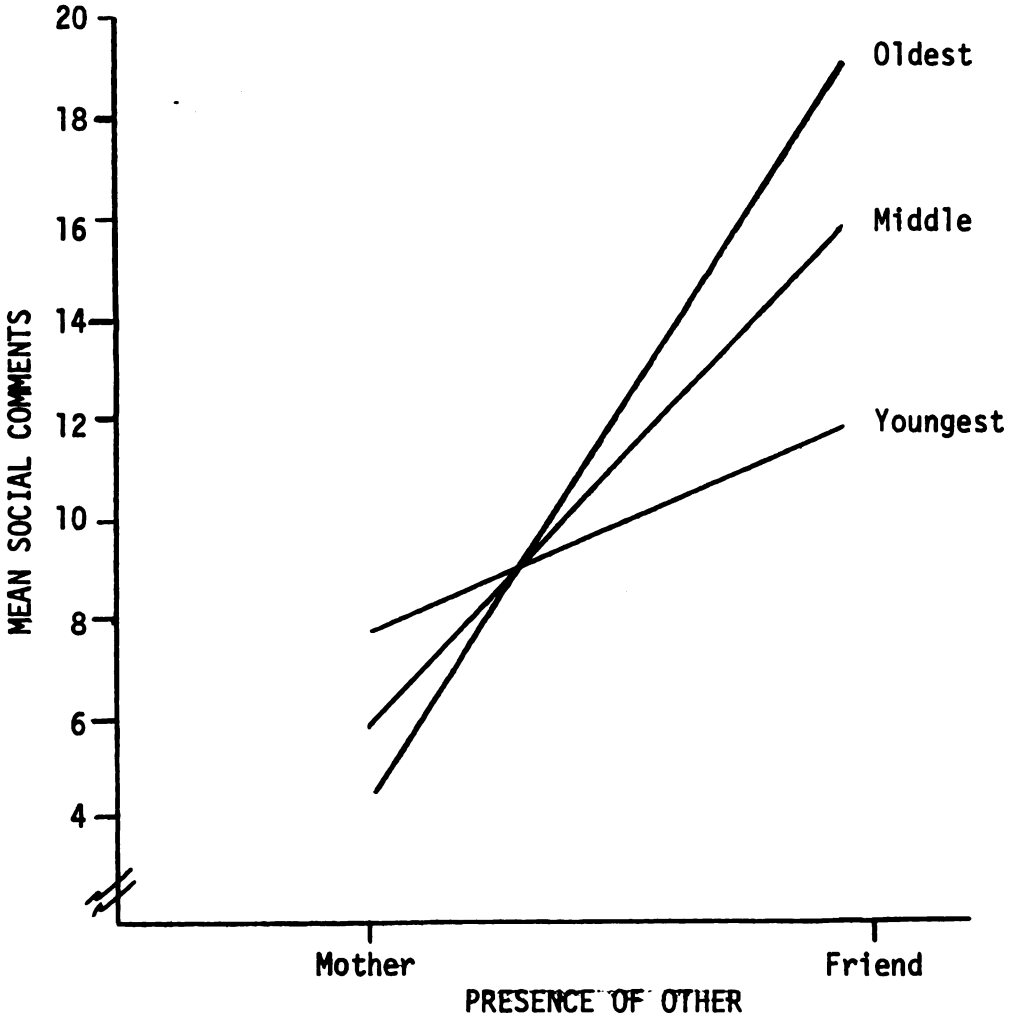

Fig. 2.--Effect of presence of other on amount of social speech for young (2 1/2-4), middle (4-5 1/2), and old (6-8) children.

y-m	7.78
y-f	11.80
m-m	5.65
m-f	15.80
o-m	4.25
o-f	19.00

Order

The order of sessions, that is, whether the child was with mother then friend or friend then mother, was not a significant main effect; however, it did interact with other variables. Only the higher levels of private speech (Dialog, Self-guiding, and Muttering) and social speech were affected by Order in combination with other variables. As expected, the effect of order was modified by the age of the child; unexpectedly, it was also modified by the sex of the child. The effects were interpreted in terms of dependence on the mother in a strange, new situation.

Generally the effects of Order indicate that for young children, particularly females, being with mother first facilitated audible Inner-directed speech. Males on the other hand were more likely to show high levels of audible Inner-directed speech if with a friend first (i.e., they displayed less dependence on mother in the strange situation). Self-guiding: Order x Sex--$F = 6.8$, df 1, 48; $p < .01$; Sex x Age--$F = 3.7$; df 2, 48; $p < .05$; Order x Sex x Age--$F = 3.8$, df 2, 48; $p < .05$). Being with mother first generally facilitated Inaudible muttering, especially for males (Order--$F = 4.3$; df 1, 48; $p < .05$. Order x Sex--$F = 6.5$, df 1, 48, $p < .01$).

The only other Order effect which was significant was an incomprehensible interaction between Order x Sex x Age for social speech ($F = 5.9$; df 2, 48; $p < .01$). (See Appendix H for the interaction.)

Activity

The final concern was to analyze the effect of Activity on the forms of private speech. As predicted, Activity did have a large effect on the type of speech displayed. As Table 11 shows, higher levels of private speech (Dialog and Self-guiding) were greater during a structured, difficult task than during unstructured free play. This fits the function of Inner-directed speech, i.e., to keep the child at the task at hand. Lower levels of private speech (Level I Self-stimulation and Level II Outer-directed private speech) were greater during free play than during structured, difficult tasks. This finding supports Vygotsky's (1962) assumption that private speech does serve a cognitive, task-solving function.

For the lower levels of private speech (Self-stimulation, and Level II categories--Commanding objects and Describing activity) and for Self-guiding private speech only the main effect of Activity was significant. However, for Dialog, Inaudible muttering and

TABLE 11

MEAN FREQUENCY OF 6 CATEGORIES OF EGOCENTRIC SPEECH AND SOCIAL SPEECH DURING TASKS AND FREE PLAY

		Tasks	Free play	F	df	P
Level I	Presocial-Self-stimulating					
	1. Repetition and Word Play	5.5	8.2	26.9	1/48	.001
Level II	Outer-Directed					
	2. Commanding Objects	3.1	6.1	45.6	1/48	.001
	3. Describing Activity	10.3	11.9	4.0	1/48	.05
Level III	Inner-Directed					
	4. Dialog	4.1	3.3	4.4	1/48	.05
	5. Self-Guiding	10.5	8.1	17.7	1/48	.001
Level IV	External Manifestation of Inner Speech					
	6. Inaudible muttering	1.7	1.9			N.S.
Social Speech		9.1	12.4	23.9	1/48	.001

social speech several significant interactions modified the effect of Activity.

Generally, the effect of Activity on Dialog, i.e., an increase in Dialog during tasks, was strongest for females. Almost all females displayed more Dialog during tasks than during free play with the exception of the youngest females when with their mothers. For the males, only the youngest boys with their mothers and middle boys with their friends showed more Dialog during tasks. For other boys Dialog during tasks and during free play was about the same (Person X Activity, $F = 4.0$; df 1, 48; $p < .05$; Sex X Person X Activity, $F = 5.4$; df 1, 48; $p < .05$; Sex X Age X Person X Activity, $F = 4.4$; df 2, 48; $p < .05$). Because these interactions were not repeated for Self-guiding private speech (the other measure of Level III Inner-directed private speech) and because they are not particularly strong effects, their meaning is questionable.

Inaudible muttering was the only form of speech not to show a significant Activity main effect. The direction of the interaction effects explains this. A significant Person x Activity effect showed that when children were with their mother there was more Inaudible muttering, especially during free play. It may be that free play leads to more total speech but that the presence of mother suppresses more overt expression thus increasing Inaudible muttering ($F = 18.1$; df 1, 48; $p < .001$). Generally, regardless of

Activity, there was more Inaudible muttering with mother than with friend. Task and free play lead to the same amount of muttering; the two exceptions were young children with their mothers who muttered slightly more in free play and older children with their friends who muttered more during the tasks (Age x Person x Activity, $F = 3.3$; df 2, 48; $p < .05$). That is, only the older children with their friends followed the prediction of higher levels of Inaudible muttering during tasks. This may reflect a difference in the rating. Young children who muttered inaudibly were usually talking loudly, but in a garbled fashion so that the raters were unable to understand. Older Ss who muttered inaudibly were clearly talking to themselves in very low tones, i.e., their Inaudible muttering was definitely Inner-directed and we would expect more of this type of speech during the tasks. For the younger Ss, their Inaudible muttering looked more like Outer-directed speech but it was difficult for the raters to understand.

Social speech was also significantly affected by Activity in combination with other factors. Like the lower levels of private speech, social speech increased during free play and decreased during tasks. Unlike the lower levels, however, social speech did show the predicted Age x Activity interaction ($F = 7.0$, df 2, 48; $p < .01$). As Figure 3 shows youngest children showed the least

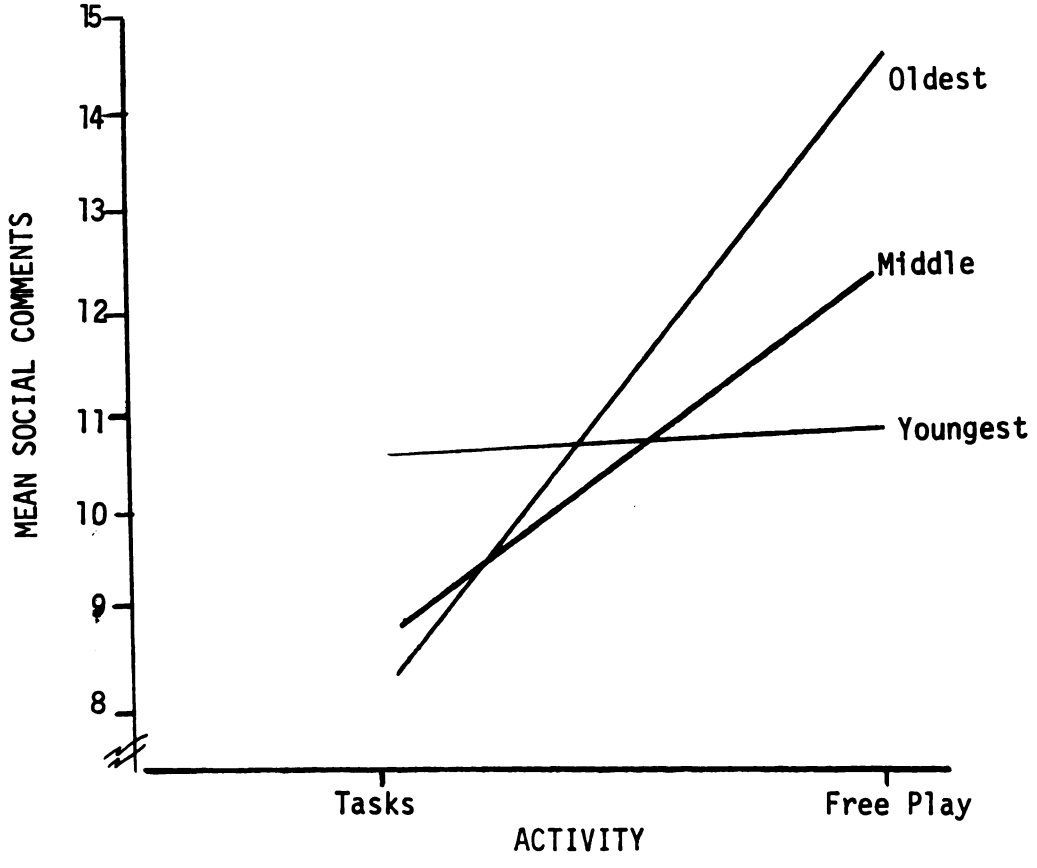

Fig. 3.--Effect of Activity on amount of social speech for young (2 1/2-4), middle (4-5 1/2), and old (6-8) children.

y-t	9.72
y-f	9.85
m-t	8.98
m-f	12.48
o-t	8.45
o-f	14.80

effect of Activity on their social speech, middle children showed a moderate effect and oldest children showed the greatest effect.

Although Age x Activity trends were the same for both males and females whether with mother or friend, a significant Sex x Age x Activity interaction reflected a greater effect of activity on middle females and older males than on middle males and older females ($F = 3.4$; df 2, 48; $p < .05$). And a significant Age x Person x Activity interaction reflected a stronger Activity effect for older children with their friends than for younger children with their mothers ($F = 3.5$; df 2, 48; $p < .05$). That is, in the interactions, the factors worked the same way that they did in the main effects with a multiplicative effect accentuating the differences between groups.

Forms of Egocentric Speech

The prediction that because egocentric speech reflects the child's cognitive developmental level, the forms of egocentric speech should be somewhat consistent for a given individual across situations was examined by looking at the occurrence of Level I--Self-stimulation, Level II--Outer-directed, and Level III--Inner-directed private speech in free play and in tasks. The correlations

are shown in Table 12. The positive intercorrelations between all measures indicate that the child who is high in one category of egocentric speech is also somewhat likely to be high in others, i.e., speaking about egocentric speech as a unitary concept does have support. However, the fact that each category is most highly correlated with itself in the 2 situations indicates that each form is measuring a different level of private speech. The finding that the second highest correlation is with that level of speech closest in order indicates that the levels are in the correct order.

The hypothesis that the 6 categories of private speech represent different forms of private speech which may be clustered in the following way:

Level I	1. Self-stimulation
Level II	Outer-directed private speech
	2. Commanding objects
	3. Describing activity
Level III	Inner-directed private speech
	4. Dialog
	5. Self-guiding
Level IV	6. Inaudible muttering

was supported by the pattern of occurrence dependent upon intrapersonal and situational variables. As seen in Tables 1, 2, 10, and 11 and in the reported effects of Order and Age x Person, both of the Level II Outer-directed measures--Commanding objects and

TABLE 12

CORRELATIONS BETWEEN LEVELS OF EGOCENTRIC SPEECH DURING A TASK AND DURING FREE PLAY

		Speech During Tasks		
		I Self-stim.	II Outer-direct.	III Inner-direct.
Speech During Free play				
I	Self-stimulation	.59***	.25*	.21
II	Outer-directed	.25*	.66***	.36**
III	Inner-directed	.21	.36**	.59***

*p < .05
**p < .01
***p < .001

Describing activity--showed the same patterns of occurrence and these patterns differed systematically from all other levels and especially from Level III--Inner-directed measures. Both of the Level III Inner-directed measures, Dialog and Self-guiding speech, showed predominantly the same pattern of occurrence and these patterns differed systematically from all other levels. Level I Self-stimulation differed from other levels of private speech but showed a pattern most similar to Level II Outer-directed speech. Level IV Inaudible Muttering differed from other levels of private speech, but showed a pattern most similar to Level III Inner-directed speech. Social speech differed from all levels of private speech and showed no systematic similarity with any one level of private speech. These findings indicate that the levels and forms used were appropriate for this analysis of private speech.

SUMMARY AND DISCUSSION

The summary and discussion is organized around the original questions posed at the end of the review of literature. The first issue is whether cognitive-developmental and intrapersonal characteristics of the child are interrelated, and whether they influence the amount and form of private speech. The results of the analysis of private speech do not clearly support either Vygotsky or Piaget, but rather support a developmental view which incorporates portions of both theories. Support was not found for Vygotsky's curvilinear relationship between private speech and increasing MA or CA. During this developmental period (2 1/2-8) the occurrence of Outer-directed private speech decreased monotonically, as Piaget suggested. Inaudible muttering did increase as suggested by Vygotsky, but Inner-directed private speech remained the same across this age sample.

The relationships found between intrapersonal characteristics and private speech support the hypothesis that the child's developing self-regulation is related to private speech, as Vygotsky's theory implies. Increasing chronological age and mental age between the ages of 2 1/2-8 correspond to a decrease in impulsivity, an increase in self-control, and an increase in persistence

and success at a difficult task. The major difference between young, impulsive, less controlled children and older, reflective, more controlled children is in the immature child's continued use of lower levels of private and social speech in task situations. The older, reflective, more controlled child tends to inhibit these lower forms of private speech and social speech in situations where they would interfere with performance. Higher levels of private speech tend to be the same across all ages. So, intrapersonal and developmental growth between ages 2 1/2 and 8 correlates with inhibition of lower levels of private speech but does not correspond to any changes in higher levels of private speech. This contrasts with Kohlberg's and Klein's findings that higher levels of private speech show an increase over age. However, closer inspection of the two studies indicates why there are discrepant findings. Kohlberg used proportions or ratios of private speech rather than frequencies. The significant increase in the proportion of Inner-directed speech merely reflects the large decrease in total private speech accounted for primarily by the decrease in Outer-directed private speech. The frequency analysis gives a more sensitive indication of what is happening to private speech between 2 1/2 and 8 years of age.

Klein found an increase in the frequency of higher level, task relevant speech between ages 3-10, whereas, this study found

no such increase. One possible reason for the contradictory findings is the different definitions of "task relevant" private speech. Klein defined task relevant speech as any speech which referred to the task as defined by the experimenter. This speech could be self-guiding (occur prior to the child's actions) or describing (occur after the child's actions). The present study defined task relevant speech as speech which referred to the task as defined by the child. So, for example, if the child stopped working on puzzles (the task as defined by E) and began working with playdough (the task as defined by S) his speech, if self-guiding, was scored as higher-level private speech. It is possible that with increasing age children use more task-relevant speech to help keep themselves at the task as defined by E. However, they do not use more self-guiding speech with increasing age. In other words, Klein emphasized private speech which was task relevant, while the present study emphasized speech that was self-guiding.

While both Piaget and Vygotsky assumed a cognitive-developmental view of private speech, they differed in their functional analysis of such speech. Piaget assumed that it reflected an immature attempt at communication to others which disappears with increasing age and increasing interaction with peers. In contrast, Vygotsky assumed that it reflects a transitional stage during which a differentiation between mature inner thought and

clear social communication is occurring. Vygotsky thus assumed a communicative intent for both private and social speech; in one the child speaks to himself, in the other he speaks to another person. Piaget assumed a communicative intent only for social speech. The findings of this study tend to be more consistent with Vygotsky's interpretation as opposed to Piaget's although an incorporation of both views tends to handle the data most adequately.

The overall effect of person present on private speech supports Vygotsky's premise that the more similar the companion is to the child, the greater the frequency of private speech. Supporting Vygotsky's theory, the presence of a peer increased both social and private speech whereas being with an adult generally inhibited both social and private speech. Slight age differences in the type of private speech exhibited clarified these results. Although young children show an increase in social speech and Outer-directed private speech when with a friend, they are more apt to show Inner-directed speech if with their mothers. Mother facilitates this more advanced level only for young children. It may be as Piaget suggested, that the young child (2 1/2-4) may not distinguish his own wishes from those of the adult--thus the presence of the adult facilitates Inner-directed comments.

The presence of the mother may be an external signal for self-control, even if she does not tell the child what to do.

Children generally showed 3 times as much social speech with their friends as with their mothers. Since the instructions to the children were to work alone, this difference in amount of social speech may partially reflect a greater ability to follow instructions with mother present than with friend present; in this sense, she may be a reminder for control.

Like the younger children, older children showed more social and Outer-directed speech with peers than with mother. However, unlike the younger children, older children also showed much higher levels of Inner-directed private speech with a friend than with mother. (For older children only Inaudible muttering was higher with mother.) The large increase in Inner-directed speech with friend may indicate that the child is gaining the ability for self-control during this age range (4-8) and control of his own behavior is more necessary in the presence of another child than it is in the presence of the mother who is already a signal of external control.

Older children also showed a larger increase in social speech when with friend than did younger children. Social speech for the older children was clearly distinct from private speech and easily rated by the raters. Younger children's social speech was much harder to rate in that it frequently looked like Outer-directed private speech. This developmental trend toward clearly distinct

social speech may indicate a trend toward differentiation between social and private speech as Vygotsky has suggested.

Thus, increasing the possibility for social interaction leads to increases in social speech and in private speech; and increasing age leads to a clearer distinction between the two functionally separate types of speech, as social speech becomes more elaborated and private speech more abbreviated and inner-directed.

The effect of activity on private speech partially supported Vygotsky's functional analysis. The effect of Activity was predominantly the same for children of all ages; free play led to more Outer-directed, Self-stimulation and social speech, whereas tasks led to more Inner-directed speech. It appears that during a task, children used private speech to direct their behavior; i.e., Inner-directed speech served a task-solving function as Vygotsky suggested. However, a significant Age X Activity interaction which would be needed for strong support of the Vygotsky analysis was found only for social speech.

The reported changes in private speech with age and with activity suggest that the major developmental changes are occurring in the lower levels of private speech rather than in the upper levels. That is, inhibition of the lower levels during tasks and with increasing age is not accompanied by increases in the higher levels of private speech. Self-stimulation, Outer-directed, and

social speech probably do not help the child to work on the tasks; the correlations substantiate this: staying on the task and number of hard puzzle pieces completed were negatively correlated with Outer-directed speech, social speech, and Self-stimulating speech. Oldest children seemed most sensitive to the changing demands of the situation, i.e., with difficult tasks they were most likely to inhibit the lower levels of private speech and social speech. However, older children did not show the predicted increases in Inner-directed speech as the Activity became difficult.

The results of this study indicate that private or egocentric speech encompasses two broad categories of speech which differ functionally and topographically from one another. The separation seems to be between the lower levels and the upper levels of private speech as outlined by Kohlberg. The lower levels of private speech--Level I self-stimulation and Level II Outer-directed (Commanding objects and Describing activity)--show greater sensitivity to developmental phenomena (CA, MA, impulsivity, self-control) than do the higher levels--Level III Inner-directed (Dialog, and Self-guiding) and Level IV Inaudible muttering. The two lower levels (3 lower categories) all responded similarly depending upon intrapersonal and situational variables. Likewise, the two higher levels (3 higher categories) responded similarly depending upon intrapersonal and situational variables.

These two broad categories of private speech each appear to be functionally different--one more amenable to the Piaget analysis, the other more amenable to the Vygotsky analysis. The lower levels may best be categorized by Piaget's "egocentric speech," i.e., these lower levels may be presocial speech, immature attempts at communication which serve no cognitive function, and eventually through socialization lead to more effective social speech. Support for this conceptualization of the lower levels comes from the following: a) the monotonic decreasing function between age and Outer-directed private speech; b) the negative correlation between these levels of speech and completing the tasks; c) the relatively lower occurrence of these levels during tasks.

The higher levels may best be categorized by Vygotsky's "private speech," i.e., these higher levels may serve a cognitive-communicative function of communication to the self for self-awareness and self-guidance. As the child matures, this speech becomes more inner-directed and inaudible as it turns into mature inner thought--clearly distinct from social speech. Support for this conceptualization of the higher levels comes from the following: a) the relative increase in higher levels during tasks; b) the relatively larger increase in self-guiding and social speech when older children are with their friends (following Vygotsky's

hypothesis) and the fact that their social and Inner-directed speech were obviously distinct--with social speech elaborated and private speech abbreviated; c) the increase in Inaudible muttering with increasing age; d) the suggestion of a curvilinear relationship between MA and Inner-directed speech.

The conclusion to be drawn from this study is that private speech occupies a major part of the child's total speech. Some of this private speech serves a cognitive, self-directing function, part serves only to stimulate the child or serves no cognitive function at all but is an immature attempt at communication. Clearly, the child goes through a period in which he differentiates between speech to himself and speech to others. As speech to others becomes more differentiated, Outer-directed private speech drops out. As Outer-directed speech diminishes, Inner-directed speech occupies a greater proportion of the child's private speech. The eventual fate of this Inner-directed speech would appear to be mature inner thought; however, verification awaits more research with an older age sample.

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APPENDICES

APPENDIX A

LETTER TO PARENTS

February 2, 1972

Dear Parent:

This is a request to have your child participate in a study on "private speech." Private speech is that speech in which the child seems to be talking to himself. All children between the ages of 2-8 do this, and it may reveal the development of thinking or problem solving; but we do not know for sure.

In order for your child to participate, I will need to set up three times at your convenience when you could bring your child to campus. The first session will be for an hour, the second and third for half an hour. You will be reimbursed for your time ($6).

Mike Rassier, Dave Risk, or I will be contacting you within the week to answer any questions you might have and to find out if you can help us in our study.

Thank you for considering this request.

Sincerely,

Jane Dickie
Psychology Graduate Student
Michigan State University

APPENDIX B

LIST OF PUZZLES USED DURING TASKS

Playschool	Birds I See	155-19
Playschool	Birthday Party	155-20
Playschool	3-D Cat	
Playschool	3-D Elephant	
Golden Book	3 puzzles	
Golden Book	3 puzzles	

APPENDIX C

PICTORIAL ABSURDITIES

Say "I have some pictures here. Some of them may have something foolish about them--something silly. You tell me each time what is foolish, what is silly about the picture.

Here is the first one, is there something silly about this? Tell me about it." (Continue for other pictures.)

Record whether the answer is correct and reaction time. RT is measured from the moment the child sees the card until he makes a response even if the response is incorrect or he corrects himself later. (If the latter is correct make note of this.)

		Correct/RT			Correct/RT
1.	baby carriage		10.	piano	
2.	man driving		11.	boy violin	
3.	girl coat		12.	wedding	
4.	child tray		13.	boy writing	
5.	boy pail		14.	vegetables	
6.	man money		15.	fence posts	
7.	man paper		16.	building	
8.	man rain		17.	groceries	
9.	tree apples		18.	child skating	

Total N correct_____ Total RT_____

MA_____ Mean RT_____

APPENDIX D

THE FARM GAME

FOLLOWING INSTRUCTIONS

(Important: Note all additional responses child makes during each task.)

1. Put Farmer Jones by the house.

2. Take the dog and put it by the fence.

(Read directions: "Now I will tell you several things to do. Listen carefully then do only what I say.")

(If child begins before complete directions have been read, gently hold his hand while repeating directions.)

3. Take the pigs and put them by the fence. Take the cow and put it by the fence.

4. Take the dog and put it under the shade tree. Drive the tractor to Farmer Jones' house.

5. Take Farmer Jones and put him by the big shade tree. Drive the truck to Farmer Jones' house. Take the cow to Farmer Jones' house.

Appendix D (cont.)

6. Put the apples by the big shade tree. Take the cow and put it by the barn. Drive the truck to the fence.

7. Drive the tractor to the big shade tree. Put the dog by the barn. Drive the truck to the big house. Put the apples by the fence.

APPENDIX E

DEFINITIONS OF THE CATEGORIES OF PRIVATE SPEECH AND SOCIAL SPEECH DEFINITIONS FOR RATING

Level I Presocial Self-stimulating Language

1. Word play and repetition--repeating words for own sake (Ex. "Whats a, whats a, dooodooodooo).

Level II Outward-directed Private Speech

2. Remarks addressed to non-human objects (Ex. "Get in there." Addressed to a puzzle piece.) might have some dialog here too <u>if</u> outward directed, i.e., speech to a generalized other. If child says Mommy but nothing else and continues with work--not expecting an answer.

3. Describing own activity not related to following activity--Remarks about own activity which communicate no information to the listener not apparent from watching him, that is describing aspects of the self's activity which are visible to the other person whose attention does not need to be directed to it. The description is in a form which has no task-solving relevance or planning function. Most often it is present rather than past tense and never future tense. Ex. "Here is the red crayon." or "Look at this." or If child says numbers as when dialing phone--count all numbers within 10 seconds as <u>one</u> frequency.

Level III Inward-directed or self-guiding private speech

4. Questions asked or answered by the self--for ex. "Do you know why we wanted to do that/ Because I need it to go a different way." or "What's that noise." May include justification for something.

Appendix E (cont.)

5. Self-guiding comments--The child talks to himself as though he were thinking aloud. He does not address anyone. Ex. "The wheels go here. We need to start it all over again." The difference between this category and 3--Describing own activity is that these comments are task or goal oriented. Speech precedes and controls activity rather than follows it. Such speech often involved cognitive analysis or inferring, for example, reasons for action or in action, analysis or the reasons for action or in action, analysis of the situation, or references to nonvisible aspects of the activity. "I don't hear anybody." If saying numbers before dialing--count all numbers uttered within 10 seconds as one frequency. Child expresses wish or desire for something but doesn't mention another person.

Level IV External manifestations of inner speech

6. Inaudible muttering--statements uttered in such a low voice that they are not decipherable to an auditor close by.

Social speech--Child looks at other person when speaking. Child desires or demands response from other person. Child may start out social and then begin private--note spacing--may count in 2 places.

Note: Watch for spacing to decide if an utterance counts as one or 2 statements. For example: "MaMa" (Space) "Do you know what this is?" (Number 4).

READ BEFORE EACH SESSION

APPENDIX F

ANALYSIS OF VARIANCE FOR 6 CATEGORIES OF PRIVATE SPEECH AND SOCIAL SPEECH

TABLE F-1

ANOVA FOR LEVEL I PRIVATE SPEECH: SELF-STIMULATING

Source of Variance	SS	df	F	P
Order	.7	1	<1	n.s.
Sex	275.	1	4.4	<.05
Age	129.	2	1.0	n.s.
Order x Sex	51.	1	<1	n.s.
Order x Age	17.	2	<1	n.s.
Sex x Age	248.	2	2.0	n.s.
Order x Sex x Age	16.	2	<1	n.s.
error	2993.	48		
Person	531.	1	26.2	<.001
Order x Person	16.	1	<1	n.s.
Sex x Person	1.	1	<1	n.s.
Age x Person	11.	2	<1	n.s.
Order x Sex x Person	.2	1	<1	n.s.
Order x Age x Person	24.	2	<1	n.s.
Sex x Age x Person	123.	2	3.1	<.10
Order x Sex x Age x Person	17.	2	<1	n.s.
error	972.	48		
Task	429.	1	26.9	<.001
Order x Task	3.	1	<1	n.s.
Sex x Task	.7	1	<1	n.s.
Age x Task	39.	2	1.2	n.s.
Order x Sex x Task	5.	1	<1	n.s.
Order x Age x Task	27.	2	<1	n.s.
Sex x Age x Task	31.	2	1	n.s.
Order x Sex x Age x Task	88.	2	2.7	<.10
error	766.	48		
Person x Task	9.	1	<1	n.s.
Order x Person x Task	14.	1	<1	n.s.
Sex x Person x Task	59.	1	3.7	<.10
Age x Person x Task	25.	2	<1	n.s.
Order x Sex x Person x Task	3.	1	<1	n.s.
Order x Age x Person x Task	35.	2	1.1	n.s.
Sex x Age x Person x Task	.9	2	<1	n.s.
Order x Sex x Age x Person x Task	38.	2	1.2	n.s.
error	765.	48		
TOTAL	7770.	239		

Appendix F (cont.)

TABLE F-2

ANOVA FOR LEVEL II PRIVATE SPEECH: COMMANDING OBJECTS AND DESCRIBING ACTIVITY

Source of Variance	Commanding Objects				Describing Activity			
	SS	df	F	P	SS	df	F	P
Order	0	1	<1	n.s.	122	1	1.1	n.s.
Sex	154	1	4.6	<.05	16	1	<1	n.s.
Age	302	2	4.5	<.05	1910	2	9.0	<.001
Order x Sex	7	1	<1	n.s.	10	1	<1	n.s.
Order x Age	14	2	<1	n.s.	168	2	<1	n.s.
Sex x Age	55	2	<1	n.s.	77	2	<1	n.s.
Order x Sex x Age	13	2	<1	n.s.	116	2	<1	n.s.
error	1600	48			5092	48		
Person	177	1	6.6	<.01	1265	1	15.0	<.001
Order x Person	10	1	<1	n.s.	172	1	2.0	n.s.
Sex x Person	96	1	3.6	<.10	22	1	<1	n.s.
Age x Person	109	2	2.0	n.s.	415	2	2.5	<.10
Order x Sex x Person	0	1	<1	n.s.	2	1	<1	n.s.
Order x Age x Person	16	2	<1	n.s.	34	2	<1	n.s.
Sex x Age x Person	59	2	1.1	n.s.	87	2	<1	n.s.
Order x Sex x Age x Person	23	2	<1	n.s.	63	2	<1	n.s.
error	1294	48			4023	48		
Task	546	1	45.6	<.001	146	1	4.0	<.05
Order x Task	0	1	<1	n.s.	0	1	<1	n.s.
Sex x Task	8	1	<1	n.s.	127	1	3.5	<.10
Age x Task	27	2	1.1	n.s.	26	2	<1	n.s.
Order x Sex x Task	2	1	<1	n.s.	105	1	2.9	<.10
Order x Age x Task	14	2	<1	n.s.	56	2	<1	n.s.
Sex x Age x Task	16	2	<1	n.s.	143	2	2.0	n.s.
Order x Sex x Age x Task	8	2	<1		99	2	1.4	n.s.
error	575	48			1741	48		
Person x Task	23	1	1.2	n.s.	37	1	1.1	n.s.
Order x Person x Task	12	1	<1	n.s.	39	1	1.1	n.s.
Sex x Person x Task	7	1	<1	n.s.	131	1	3.8	<.10
Age x Person x Task	61	2	1.7	n.s.	13	2	<1	n.s.
Order x Sex x Person x Task	4	1	<1	n.s.	4	1	<1	n.s.
Order x Age x Person x Task	16	2	<1	n.s.	79	2	1.1	n.s.
Sex x Age x Person x Task	37	2	1.0	n.s.	42	2	<1	n.s.
Order x Sex x Age x Person x Task	24	2	<1	n.s.	8	2	<1	n.s.
error	877	48			1651	48		
TOTAL	6189	239			18038	239		

Appendix F (cont.)

TABLE F-3

ANOVA FOR LEVEL III PRIVATE SPEECH: DIALOG AND SELF-GUIDING

Source of Variance	Dialog				Self-Guiding			
	SS	df	F	P	SS	df	F	P
Order	1	1	<1	n.s.	2	1	<1	n.s.
Sex	9	1	<1	n.s.	23	1	<1	n.s.
Age	17	2	<1	n.s.	23	2	<1	n.s.
Order x Sex	52	1	2.5	n.s.	388	1	6.8	<.01
Order x Age	156	2	3.8	<.05	210	2	1.8	n.s.
Sex x Age	43	2	1.0	n.s.	421	2	3.7	<.05
Order x Sex x Age	71	2	1.7	n.s.	432	2	3.8	<.05
error	994	48			2752	48		
Person	79	1	5.4	<.05	1854	1	44.3	<.001
Order x Person	1	1	<1	n.s.	172	1	4.1	<.05
Sex x Person	6	1	<1	n.s.	9	1	<1	n.s.
Age x Person	451	2	15.4	<.001	1594	2	19.1	<.001
Order x Sex x Person	15	1	1.0	n.s.	179	1	4.3	<.05
Order x Age x Person	18	2	<1	n.s.	19	2	<1	n.s.
Sex x Age x Person	9	2	<1	n.s.	133	2	1.6	n.s.
Order x Sex x Age x Person	41	2	1.4	n.s.	63	2	<1	n.s.
error	706	48			2008	48		
Task	34	1	4.4	<.05	358	1	17.7	<.001
Order x Task	2	1	<1	n.s.	7	1	<1	n.s.
Sex x Task	1	1	<1	n.s.	16	1	<1	n.s.
Age x Task	23	2	15	n.s.	6	2	<1	n.s.
Order x Sex x Task	13	1	1.7	n.s.	59	1	2.9	<.10
Order x Age x Task	34	2	2.2	n.s.	9	2	<1	n.s.
Sex x Age x Task	52	2	3.4	<.05	63	2	1.6	n.s.
Order x Sex x Age x Task	1	2	<1	n.s.	72	2	1.8	n.s.
error	366	48			969	48		
Person x Task	25	1	4.0	<.05	44	1	2.5	n.s.
Order x Person x Task	3	1	<1	n.s.	22	1	1.3	n.s.
Sex x Person x Task	34	1	5.4	<.05	23	1	1.4	n.s.
Age x Person x Task	32	2	2.5	<.10	48	2	1.4	n.s.
Order x Sex x Person x Task	13	1	2.1	n.s.	4	1	<1	n.s.
Order x Age x Person x Task	23	2	1.8	n.s.	26	2	<1	n.s.
Sex x Age x Person x Task	55	2	4.4	<.05	13	2	<1	n.s.
Order x Sex x Age x Person x Task	1	2	1	n.s.	79	2	2.3	n.s.
error	301	48			833	48		
TOTAL	3684	239			12930	239		

Appendix F (cont.)

TABLE F-4

ANOVA FOR LEVEL IV: INAUDIBLE MUTTERING

Source of Variance	SS	df	F	P
Order	26	1	4.3	<.05
Sex	6	1	<1	n.s.
Age	60	2	5.0	<.01
Order x Sex	39	1	6.5	<.01
Order x Age	13	2	1.0	n.s.
Sex x Age	1	2	<1	n.s.
Order x Sex x Age	8	2	<1	n.s.
error	290	48		
Person	100	1	15.6	<.001
Order x Person	29	1	4.5	<.05
Sex x Person	20	1	3.1	<.10
Age x Person	3	2	<1	n.s.
Order x Sex x Person	14	1	2.1	n.s.
Order x Age x Person	4	2	<1	n.s.
Sex x Age x Person	0	2	<1	n.s.
Order x Sex x Age x Person	18	2	1.4	n.s.
error	309	48		
Task	5	1	1.0	n.s.
Order x Task	33	1	7.5	<.01
Sex x Task	10	1	2.5	n.s.
Age x Task	0	2	<1	n.s.
Order x Sex x Task	6	1	1.4	n.s.
Order x Age x Task	5	2	<1	n.s.
Sex x Age x Task	1	2	<1	n.s.
Order x Sex x Age x Task	13	2	1.5	n.s.
error	211	48		
Person x Task	46	1	18.1	<.001
Order x Person x Task	10	1	3.9	<.05
Sex x Person x Task	2	1	<1	n.s.
Age x Person x Task	17	2	3.3	<.05
Order x Sex x Person x Task	1	1	<1	n.s.
Order x Age x Person x Task	5	2	1.0	n.s.
Sex x Age x Person x Task	7	2	1.5	n.s.
Order x Sex x Age x Person x Task	17	2	3.3	<.05
error	122	48		
TOTAL	1449	239		

Appendix F (cont.)

TABLE F-5

ANOVA FOR SOCIAL SPEECH

Source of Variance	SS	df	F	P
Order	65	1	1.2	n.s.
Sex	113	1	2.2	n.s.
Age	135	2	1.3	n.s.
Order x Sex	63	1	1.2	n.s.
Order x Age	40	2	<1	n.s.
Sex x Age	62	2	<1	n.s.
Order x Sex x Age	615	2	5.9	<.01
error	2513	48		
Person	5578	1	113.2	<.001
Order x Person	2	1	<1	n.s.
Sex x Person	51	1	1.0	n.s.
Age x Person	1158	2	11.7	<.001
Order x Sex x Person	46	1	<1	n.s.
Order x Age x Person	341	2	3.5	<.05
Sex x Age x Person	72	2	<1	n.s.
Order x Sex x Age x Person	3	2	<1	n.s.
error	2366	48		
Task	663	1	23.9	<.001
Order x Task	33	1	1.2	n.s.
Sex x Task	12	1	<1	n.s.
Age x Task	388	2	7.0	<.01
Order x Sex x Task	2	1	<1	n.s.
Order x Age x Task	15	2	<1	n.s.
Sex x Age x Task	189	2	3.4	<.05
Order x Sex x Age x Task	103	2	1.9	n.s.
error	1332	48		
Person x Task	108	1	3.8	<.10
Order x Person x Task	39	1	1.4	n.s.
Sex x Person x Task	51	1	1.8	n.s.
Age x Person x Task	201	2	3.5	<.05
Order x Sex x Person x Task	5	1	<1	n.s.
Order x Age x Person x Task	2	2	<1	n.s.
Sex x Age x Person x Task	171	2	3.0	<.10
Order x Sex x Age x Person x Task		2	<1	n.s.
error	1365	48		
TOTAL	17933	239		

APPENDIX G

SIMPLE CORRELATIONS

Var.	No.	1	2	4	5	8	9	11	12	13	14	15	17	18	20	21	23	33	34	35	36	37	38	39	40
SEX	1	--																							
CA	2	-.07	--																						
IQ	4	-.18	.21	--																					
MA	5	-.16	.83	.69	--																				
IN-EROR1	8	-.05	-.67	-.30	-.67	--																			
IN-EROR2	9	-.15	-.75	-.22	-.67	.81	--																		
NCOR	11	.00	.79	.40	.76	-.69	-.69	--																	
RTFORCOR	12	.29	-.01	-.14	-.12	-.03	-.07	.05	--																
NINCOR	13	.02	-.67	-.16	-.57	.73	.69	-.80	-.15	--															
RTINCOR	14	.12	.25	.14	.23	-.29	-.18	.42	.58	-.37	--														
FARMCOR	15	.08	.53	.28	.55	-.47	-.44	.48	.09	-.38	.18	--													
EGGS	17	-.03	.30	.25	.33	-.25	-.37	.36	.06	-.26	.23	.12	--												
VTMWORK	18	.04	.38	.15	.36	-.19	-.32	.35	.03	-.23	.11	.45	.16	--											
MHCOMP	20	.27	.15	.07	.13	-.16	-.18	.20	-.00	-.14	-.08	.31	.02	.36	--										
VTFWORK	21	.21	.52	.31	.53	-.36	-.48	.44	-.01	-.25	.04	.46	.23	.58	.34	--									
FHDCOMP	23	.29	.20	.27	.28	-.21	-.20	.32	-.01	-.29	-.14	.17	.12	.27	.61	.44	--								
TSELF-ST	33	-.30	-.13	-.19	-.18	.24	.36	-.23	-.30	.17	-.15	-.11	-.17	-.15	-.04	-.35	-.12	--							
TOUTDRCT	34	.05	-.56	-.27	-.55	.35	.59	-.56	-.00	.34	-.10	-.33	-.22	-.36	-.05	-.39	-.11	.37	--						
TINDRCT	35	.07	-.04	-.21	-.15	.07	.18	-.02	.13	-.09	.11	.17	-.03	.01	.24	-.13	.08	.41	.51	--					
TSOC	36	-.08	-.15	.02	-.10	.18	.04	-.24	.12	.12	-.03	-.07	.22	-.14	.03	-.26	-.12	.02	.25	.18	--				
FSELF-ST	37	-.21	-.05	.05	.03	.03	.07	-.19	-.26	.25	-.27	-.09	-.22	-.22	-.00	-.21	-.09	.59	.17	.11	.12	--			
FOUTDRCT	38	.24	-.45	-.20	-.41	.10	.24	-.46	.02	.33	-.23	-.21	-.26	-.27	.07	-.33	-.11	.25	.66	.28	.32	.41	--		
FINDRCT	39	-.12	.12	.05	.09	.02	.01	-.02	.05	-.02	.08	-.03	.05	-.08	-.04	.01	-.08	.22	.36	.59	.06	.17	.20	--	
FSOC	40	-.14	.31	.07	.23	-.13	-.21	.23	.20	-.25	.33	-.03	.22	-.02	-.08	-.04	-.10	-.05	.09	.21	.28	-.12	-.06	.42	--

APPENDIX H

INTERACTION MEANS FROM THE ANOVA*

DIALOG

TABLE H-1

MEAN FREQUENCY OF DIALOG FOR AGES: 2 1/2-4, 4-5 1/2, and 6-8 AND FOR ORDERS: MOTHER-FRIEND AND FRIEND-MOTHER

Age Groups	2 1/2-4	4-5 1/2	6-8
Order:			
Mother-friend	4.8	3.1	3.1
Friend-mother	2.8	4.9	3.7

TABLE H-2

MEAN FREQUENCY OF DIALOG FOR AGES: 2 1/2-4, 4-5 1/2, 6-8; SEX; PERSON CHILD IS WITH: MOTHER, FRIEND; AND ACTIVITY: TASK, FREE PLAY

Person	Activity	Males			Females		
		2 1/2-4	4-5 1/2	6-8	2 1/2-4	4-5 1/2	6-8
Mother	Task	7.4	1.6	1.4	3.9	4.0	.8
	Free play	3.0	2.6	2.6	6.0	3.6	.7
Friend	Task	2.1	5.7	4.8	3.8	7.3	6.2
	Free play	2.1	3.1	5.8	2.0	4.0	4.5

*Only the largest inclusive interactions are included here.

Appendix H (cont.)

SELF-GUIDING

TABLE H-3

MEAN FREQUENCY OF SELF-GUIDING SPEECH FOR AGE: 2 1/2-4, 4-5 1/2, 6-8; ORDER: MOTHER-FRIEND, FRIEND-MOTHER: AND SEX

Age Groups	Males			Females		
	2 1/2-4	4-5 1/2	6-8	2 1/2-4	4-5 1/2	6-8
Order:						
Mother-friend	8.8	7.1	8.9	11.6	9.7	9.4
Friend-mother	12.5	8.5	12.1	3.1	11.9	8.6

TABLE H-4

MEAN FREQUENCY OF SELF-GUIDING SPEECH FOR AGES: 2 1/2-4, 4-5 1/2, AND 6-8; AND PERSON CHILD IS WITH: MOTHER, FRIEND

Age Groups	2 1/2-4	4-5 1/2	6-8
Person:			
Mother	9.5	6.3	3.9
Friend	8.5	12.3	15.5

Appendix H (cont.)

SELF-GUIDING (cont.)

TABLE H-5

MEAN FREQUENCY OF SELF-GUIDING SPEECH FOR SEX; ORDER: MOTHER-FRIEND (M-F), FRIEND-MOTHER (F-M); AND PERSON CHILD IS WITH: MOTHER, FRIEND

Person	Males		Females	
Order	M-F	F-M	M-F	F-M
Mother	5.7	8.4	5.5	6.6
Friend	10.8	13.6	14.9	9.1

INAUDIBLE MUTTERING

TABLE H-6

MEAN FREQUENCY OF INAUDIBLE MUTTERING FOR SEX AND ORDER: MOTHER-FRIEND, FRIEND-MOTHER

Order	Mother-friend	Friend-mother
Males	2.7	1.2
Females	1.6	1.7

TABLE H-7

MEAN FREQUENCY OF INAUDIBLE MUTTERING FOR ORDER: MOTHER-FRIEND, FRIEND-MOTHER; AND PERSON: MOTHER, FRIEND

Order	Mother-friend	Friend-mother
Mother	3.1	1.8
Friend	1.1	1.2

Appendix H (cont.)

INAUDIBLE MUTTERING (cont.)

TABLE H-8

MEAN FREQUENCY OF INAUDIBLE MUTTERING FOR ORDER: MOTHER-FRIEND, FRIEND-MOTHER; AND ACTIVITY: TASK, FREE PLAY

Order	Mother-friend	Friend-mother
Activity		
Task	1.6	1.7
Free play	2.6	1.2

TABLE H-9

MEAN FREQUENCY OF INAUDIBLE MUTTERING FOR AGES: 2 1/2-4, 4-5 1/2, 6-8; PERSON: MOTHER, FRIEND; AND ACTIVITY: TASK, FREE PLAY

	Age	2 1/2-4	4 5-1/2	6-8
Person	Activity			
Mother	Task	1.2	2.3	2.2
	Free play	2.1	3.0	4.1
Friend	Task	.9	1.4	2.2
	Free play	.4	1.4	.9

Appendix H (cont.)

SOCIAL

TABLE H-10

MEAN FREQUENCY OF SOCIAL SPEECH FOR AGE: 2 1/2-4, 4-5 1/2, 6-8; SEX; AND ORDER: MOTHER-FRIEND, FRIEND-MOTHER

	Male			Female		
Age	2 1/2-4	4-5 1/2	6-8	2 1/2-4	4-5 1/2	6-8
Order						
Mother-friend	8.2	12.8	10.2	11.0	6.5	12.6
Friend-mother	11.8	11.5	14.1	8.3	12.2	9.6

TABLE H-11

MEAN FREQUENCY OF SOCIAL SPEECH FOR AGE: 2 1/2-4, 4-5 1/2, 6-8; ORDER: MOTHER-FRIEND (M-F); FRIEND-MOTHER (F-M) AND PERSON: MOTHER, FRIEND

	M-F			F-M		
Age	2 1/2-4	4-5 1/2	6-8	2 1/2-4	4 5-1/2	6-8
Person						
Mother	7.8	5.8	2.4	7.8	5.6	6.2
Friend	11.4	13.5	20.5	12.3	18.1	17.6

Appendix H (cont.)

SOCIAL (cont.)

TABLE H-12

MEAN FREQUENCY OF SOCIAL SPEECH FOR AGE: 2 1/2-4, 4-5 1/2, 6-8; SEX; AND ACTIVITY: TASK, FREE PLAY

	Males			Females		
Age	2 1/2-4	4-5 1/2	6-8	2 1/2-4	4-5 1/2	6-8
Activity						
Task	9.7	11.2	7.7	9.8	6.8	9.3
Free play	10.2	13.0	16.7	9.5	12.0	13.0

TABLE H-13

MEAN FREQUENCY OF SOCIAL SPEECH FOR AGE: 2 1/2-4, 4-5 1/2, 6-8; PERSON: MOTHER, FRIEND; AND ACTIVITY: TASK, FREE PLAY

	Mother			Friend		
Age	2 1/2-4	4-5 1/2	6-8	2 1/2-4	4-5 1/2	6-8
Activity						
Task	7.2	4.9	2.7	12.3	13.1	14.2
Free play	8.4	6.5	5.8	11.3	18.5	23.8