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Portland State University

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THESIS APPROVAL

The abstract and thesis of Rebecca Jayne LaPlante for the Master of Science in Speech Communication: Speech and Hearing Science presented November 17, 1993, and accepted by the thesis committee and the department.

COMMITTEE APPROVALS:

Rhea Paul, Chair

Ellen Reuler

Sandra Wilde
Representative of the Office of Graduate Studies

DEPARTMENT APPROVAL:

Stephen A. Kosokoff, Chair
Department of Speech Communication

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ABSTRACT

An abstract of the thesis of Rebecca Jayne LaPlante for the Master of Science in Speech Communication: Speech and Hearing Science presented November 17, 1993.

Title: The Relationship Between Cognitive Skills Measured by Piagetian Tasks at Age 2 and Linguistic Skills Measured by an Expressive Language Test at Age 4 in Normal and Late Talkers

The purpose of this study was to examine the relationship between cognitive skills as measured by Piagetian tasks at approximately 2 years of age and expressive and receptive language scores from tests administered to the same children 2 years later. The questions this study sought to answer were:

1. Is there a significant difference in the performance of normal children and late-talking children on Piagetian cognitive assessment at age 2?
2. Is there a significant relationship between the cognitive scores at age 2 and language scores at age 4 in each of the two diagnostic groups?

Sixty-four subjects participated in this study, 27 children with normal language and 37 children considered to be late talkers. These children are part of the Portland Language Development Project, a longitudinal study being conducted at Portland State University, Portland, Oregon.

The instruments used to gather data for this study were the Uzgis-Hunt Scales of Infant Psychological Development, the Test of Language Development (TOLD), and the Developmental Sentence Score (DSS).

No significant difference was found between normal children and late-talking children on Piagetian tasks. No significant correlation was found between cognitive scores at age 2 and language scores at age 4. The only significant difference found between the groups was in relation to expressive language. The DSS and the expressive language score on the TOLD were significantly different between the normal and late talkers.

THE RELATIONSHIP BETWEEN COGNITIVE SKILLS MEASURED BY
PIAGETIAN TASKS AT AGE 2 AND LINGUISTIC SKILLS
MEASURED BY AN EXPRESSIVE LANGUAGE TEST
AT AGE 4 IN NORMAL AND LATE TALKERS

by

REBECCA JAYNE LAPLANTE

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of the requirements for the degree of

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in
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1993

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CHAPTER I

INTRODUCTION AND STATEMENT OF PURPOSE

INTRODUCTION

Although there is controversy as to the relation between intelligence and language development, a significant body of evidence indicates that early language development may be dependent on or associated with early cognitive skills. If it is true that cognitive skills are a prerequisite to or are highly correlated with language development, then it follows that an instrument that could be used to accurately determine early cognitive skills would be valuable in predicting whether a child will be language-delayed.

Determining whether to provide language intervention to a child showing signs of language delay in very early childhood can be very difficult. If intervention begins too early, a child would receive unnecessary treatment, thus wasting the time of the parents, child and clinician. But if timely intervention is not initiated and a child then does not develop normally, the child might experience emotional, psychological and educational problems due to his language deficits. Clearly, an instrument indicating which children would benefit from early intervention would be valuable.

One possible instrument which might indicate risk for language development is that of cognitive assessment. In the early 1900s Jean Piaget did extensive research on

thought and language development in children. He suggested that the thought of younger children is qualitatively different from that of older children (Owens, 1984). He concluded that children go through four distinct stages of cognitive development: sensorimotor, with four substages, (0-2 years) during which a child develops symbolic play; preoperational (2-7 years) where symbolic function develops further; concrete operational (7-11 years) during which thought continues to develop in relation to concrete or physical operations as compared to the last sensorimotor stage; and formal operational (11+ years) where abstract and complex reasoning develop (Owens, 1984).

Cognitive assessment using the Piagetian framework has been used extensively in the literature to assess intelligence and problem solving in children under 3. This type of assessment is ideally suited to the language delayed toddler because verbal responses are not required, and tasks can be demonstrated virtually without verbal instruction. For example, to determine whether a child has grasped the idea of object permanence, an object is hidden under a cloth. If the child removes the cloth to find the object she understands that the object exists even when not visible.

Thus, Piagetian assessment would be an ideal vehicle for evaluating cognitive skill in young children with little or no language. If this kind of assessment turns out to be a good predictor of later language growth, its value would be increased. Thal (1991) discusses the role of Piagetian assessment in the prediction of chronic language delay, and shows some degree of short-term prediction. This study addresses the question of whether this kind of assessment at age 2 can predict language outcome

over a longer period of time. If such prediction were possible it would be very valuable in deciding on intervention for toddlers who are slow to begin talking.

This study examined the relationship between cognition and language in a group of children at risk for language delay, and compared this relation to that seen in normally developing children.

STATEMENT OF PURPOSE

The purpose of this study was to examine the relationship between cognitive skills as measured by Piagetian tasks at age 2 and linguistic development at age 4 in two groups of children. One group of subjects was considered "normal talkers" and the other, "late talkers," those showing slow expressive language development as indexed by expressive vocabulary size.

Two specific questions were addressed:

1. Is there a significant difference between the performance of the normal talkers and that of the late talkers on a Piagetian cognitive assessment at age 2?
2. Is there a significant relationship between the cognitive scores at age 2 and the language scores at age 4 in each of the two diagnostic groups?

The null hypotheses for question one states that there will be no significant difference between the scores of the normal talkers and the late talkers on the cognitive assessment.

The null hypotheses for question two states that there will be no significant correlation between the cognitive scores at age 2 and language scores at age 4 in either diagnostic group.

DEFINITION OF TERMS

The following are descriptions of specific terms used in this study:

1. Causality: "Awareness of cause and effect relationships" (Nicolosi, Harryman, & Kresheck, 1983, p. 46).
2. Cognition: "A general concept embracing all of the various modes of knowing: perceiving, remembering, imagining, conceiving, judging, and reasoning" (Nicolosi et al., 1983, p. 55).
3. Expressive language: "Use of conventional symbols to communicate one's perception, ideas, feelings, or intentions to others. Ability to communicate via the spoken or printed word" (Nicolosi et al., 1983, p. 129).
4. Imitation: "Behavior that copies, almost exactly, the behavior of another" (Nicolosi et al., 1983, p. 118).
5. Late talkers: "Children ages 20-34 months of age who produce fewer than 50 different words by parent report on the Language Development Survey" (Rescorla, 1989).
6. Means-end: "The ability to separate problem-solving processes from problem-solving goals. Example: An infant hitting the top of the jack-in-the-box toy

because she has discovered that this makes the clown pop out” (McCormick & Schiefelbusch, 1990, p. 55).

7. Normal talkers: “Children ages 20-34 months of age who produce more than 50 different words by parent report on the Language Development Survey” (Rescorla, 1989).

8. Object permanence: “Understanding that objects continue to exist even when they are not in view” (McCormick & Schiefelbusch, 1990, p. 54).

9. Referential language: “Use of words to depict objects or events in a variety of contexts” (Casby & Ruder, 1983, p. 404).

10. Schemes for relating to objects/play: “The ability to perform specific actions or action sequences consistently and habitually on a variety of objects” (McCormick & Schiefelbusch, 1990, p. 55).

11. Symbolic play: “Implies the representation of an absent object and/or make-believe representation; the child substitutes objects or events (signifiers) for other objects or events (signified)” (Casby & Ruder, 1983, p. 404).

CHAPTER II

REVIEW OF THE LITERATURE

THEORIES OF LANGUAGE/COGNITION RELATIONSHIPS

Many theories suggest a relationship between early cognitive development and language acquisition. Most research in this area has used a Piagetian model of cognitive development. In this model early cognitive development is referred to as “sensorimotor intelligence.” The sensorimotor period extends from birth to 2 years and is divided into six substages as follows: Substage I, birth to 1 month; Substage II, 1-4 months; Substage III, 4-8 months; Substage IV, 8-12 months; Substage V, 12-18 months; and Substage VI, 18-24 months.

Each substage is associated with particular types of behavior in terms of knowledge of object permanence, understanding of means toward an end, understanding of causality, understanding of space, imitation, and patterns of play with objects (see Table I). Piaget believed that children must pass through sensorimotor stages in order to develop the necessary cognitive skills needed for language (Geffner, 1981; Rice, 1983). The strong version of this hypothesis in relation to language was stated by Bowerman (1974). She suggests that some specific cognitive skills such as the use of symbols for absent objects, the use of basic cognitive structures such as classification, and the ability to formulate appropriate

TABLE I

HIGHLIGHTS OF SENSORIMOTOR DEVELOPMENT

Substage	Level of Development				
	Object Permanence	Causality	Means-End	Play	Communication
I (0 to 1 month)	Out of sight, out of mind.	No concept of causality	No understanding of means-ends.	None	No communicative intent.
II (1 to 4 months)	Uses senses to make and maintain contact with objects.	No concept of causality	No understanding of means-ends.	Produces behaviors preliminary to play including grasping and looking at objects.	Cries, coos, and laughs.
III (4 to 8 months)	Watches object move and anticipates its future position. Reaches for partially hidden object.	Behaves as though he is the cause of all actions.	Produces goal-oriented behaviors but only after activity has begun.	Still very sensory but begins to interact with other people.	Babbles.

TABLE I

HIGHLIGHTS OF SENSORIMOTOR DEVELOPMENT
(Continued)

Substage	Level of Development				
	Object Permanence	Causality	Means-End	Play	Communication
IV (8 to 12 months)	Looks for an object if he sees it being hidden.	Externalizes causality. Knows other people and objects can cause activities.	Evidence of planning and the production of intentional behaviors.	Uses developing concepts in his play activities.	Links gestures and vocalizations to convey fairly specific messages.
V (12 to 18 months)	Follows sequential displacement to find hidden object.	Sees other people and objects as agents for causality in new situations.	Uses experimentation to solve problems.	Play reflects cognitive growth. he figures out how to make toys work.	Produces first meaningful words. Communication is intentional but still heavily nonverbal.
VI (18 to 24 months)	Fully developed concept of object permanence. Can now accommodate invisible displacements.	Causality enhanced by ability to represent objects and cause-effect relationships in his mind.	Can mentally represent a goal and his plan for achieving the goal.	Progresses from autosymbolic to symbolic play.	Imitates and spontaneously produces multiple word utterances.

^aAdapted from Hulit & Howard, 1993, p. 108.

concepts to be used as the structural components within which linguistic rules can operate must be present for language acquisition. Thus, these skills are thought by some to be prerequisites to language development.

The local homology model is another theory suggesting a strong connection between cognition and language. This theory claims that both cognition and language come from “a common, deeper underlying system of cognitive operations and structures that is biased toward neither” (Rice, 1983, p. 350). Thus, cognitive and related language skills appear at about the same time. Specific cognitive and language skills are linked together, but in no particular order of emergence (Rice, 1983). For example, in a study done by Corrigan (1978), a general correspondence was found between the onset of single word utterance and object permanence Stage VI. In a study by Gopnik and Meltzoff (1986) a correspondence was found between solving a means-end task and the use of success/failure words, (such as “there” or “uh-oh”). Means-end tasks were solved within a few weeks of acquiring success/failure words.

A third model is the interactionist hypothesis. This states that even in very young children language skills influence cognitive skills, just as cognitive skills influence language skills. For example, if a child learns the meaning of a word, it follows that she can then categorize the items that the word stands for. Thus, if a child learns the word “cup” she learns the characteristics peculiar to a cup and how to differentiate a cup from other objects. If presented with a cup never seen before she would recognize it as a cup. Language and cognition interact.

The weak cognition hypothesis, an alternative form of the strong cognition hypothesis, claims that cognition is responsible for some but not all language development (Cromer, 1976). Some language acquisition is independent of word meaning. Children learn more complicated ways of expressing the same concept. For example, a child first calls himself by his proper name and later calls himself “me” or “I” (Rice, 1983). The meaning has not changed but the form has.

Each of these theories suggests that cognition influences language development. This influence may range from causative to interdependent to simply correlational.

Researchers have conducted numerous studies to add credence to one or another of these theories. Studies comparing specific linguistic developments and cognitive skills have been completed. For example, Gopnik and Meltzoff (1986) as stated above, studied the relationship between the age children begin to use success/failure words and when they solved means-end tasks. McCune-Nicolich (1981) studied Stage VI of object permanence and the attainment of relational words. Other studies have approached the question in terms of a child acquiring a general sensorimotor Stage VI and particular areas of a linguistic development. For example, research by Ingram (1978) indicates stage five sensorimotor development coincides with the use of a few words, but Stage VI is required for acquisition of more than a few words.

While some studies conclude that certain cognitive skills are prerequisites for linguistic development, the majority show a more correlational development.

Tomasello and Farrar (1986) and Kahn (1984) suggests cognitive skills are prerequisite to linguistic skills, while Bates, Benigni, Bretherton, Camaioni, and Volterra (1977), Gopnik and Meltzoff (1986), and Kelly and Dale (1989), show a correlation between cognitive and linguistic skills.

LANGUAGE AND COGNITION IN NORMAL DEVELOPMENT

Four cognitive skills have been found to be particularly predictive of language development: object permanence (Siegel, 1981), means-end/causality (Bates et al., 1977; Siegel, 1981), imitation, and play with objects (Bates et al., 1977). Numerous studies have shown these particular skills to be either prerequisite to or associated with language development.

Object permanence is shown to be associated with linguistic skills ranging from the ability to use any words (Bloom, 1973; Brown, 1973; Kahn, 1984) to specific language abilities such as using relational words (McCune-Nicolich, 1981) and disappearance words (Gopnik & Meltzoff, 1986). Means-end is also shown to be predictive of the use of first words (Bates, 1979) and a range of linguistic developments. For example, Kelly and Dale (1989) suggest the use of foresight during cognitive testing is related to use of rule-governed sentences. Play with objects or schemes is also shown to be predictive of language development in a number of ways. For example, a study by Rescorla and Goossens (1992) shows a delay in expressive language was accompanied by a delay in symbolic play.

Imitation is difficult to elicit in young children. A failure to imitate may indicate lack of competence or simply an unwillingness to imitate. Although some studies have linked imitation skill to language development, the relationship was not explored in this study.

Causality, another aspect of sensorimotor development, is closely related to means-end skills. Some Piagetian scales assess causality separately, while others include causality within the means-end scale. The scale used in this study does have a separate causality section which will be reported, even though much of the literature reviewed combines means/end and causality and does not look at separate predictions for each regarding language development.

Object Permanence

According to Brown (1973) and Bloom (1973) a child must have established an understanding of the permanency of objects before being able to refer to them with a word.

Like Brown (1973) and Bloom (1973), Tomasello and Farrar (1986) concluded that object permanence is a prerequisite to certain language development. In a study of 23 children from 1 year 2 months to 1 year 9 months who were all producing single words they concluded that an understanding of object permanence is a prerequisite for learning relational words. The children were trained and evaluated for an understanding of object permanence and language development. Stage five children could learn relational words, such as “up” referring to visible movement, but not invisible movement.

The majority of evidence from this study supports associated development of specific language skills and level of object permanency development. In a longitudinal study of 3 children using the Uzgis-Hunt object permanence scales, Corrigan (1978) found a general correspondence between the onset of object permanence Stage VI and single word utterances. At an early preoperational level of object permanence she found an increase in vocabulary and the beginning of the semantic categories of recurrence and non-existence.

Another study showing associated development was done by Dihoff and Chapman (1977). They used the Uzgis-Hunt object permanence scale with 20 10- to 25-month-olds and found that children in Stage IV recognized communication games but did not use words. The Stage V children did use words, but never talked about recurrence or location and seldom talked about action. Sensorimotor Stage V closely corresponded to the comprehension of words for absent objects. In Stage VI the children talked about action, location and recurrence.

Bates et al. (1977) found object permanence was not predictive of later language, but did find similar onset times of object permanence and referential speech. This study is another example of a specific development associated with object permanence.

McCune-Nicolich (1981) conducted a longitudinal study of 5 girls who at the beginning of the study were 1 year 2 months to 1 year 6 months of age. Observing the children monthly for 30 minutes she discovered that all the children exhibited use of relational words such as "more" and "allgone" (sic), prior to attainment of late

Stage VI object permanence. Thus, she concluded that attainment of Stage VI object permanence cannot be considered a prerequisite for the use of relational words. This shows again a certain cognitive development associated with but not required for a language milestone.

A study by Gopnik and Meltzoff (1986) investigated the relation between children's performance on object concept tasks and their use of disappearance words. Children who did better on these tasks were more likely to use disappearance words than those who did not. Again, object permanence skills were associated with development, but were not shown to be a prerequisite.

A study reported by Kelly and Dale (1989) looked at the cognitive and language skills of 20 normal children between the ages of 1 and 2. Depending on ability, each child was assigned to one of four groups: No Word Users, (a parent reported the child was not using words and no spontaneous words were produced during a language sample), Single Word Users, (a parent reported a vocabulary of at least five words and at least one word was produced spontaneously during a language sample), Nonproductive Syntax Users (during a language sample two unique multiword utterances were used with no evidence that the child could use the words in isolation or combined with different words), and Productive Syntax Users, (during a language sample at least one productive utterance showing that each could be combined with different words, encode the same semantic relationship and be in the same position in two utterances).

The children were also tested for cognitive skills in four areas: object permanence, imitation, play and means-end. No significant relationship was found between object permanence and level of syntax. All but 1 subject was at Stage VI and those in all four groups passed task 14. Task 14 required finding an object hidden through a series of invisible displacements. The highest task passed, task 15, was passed by only 2 children in the productive syntax user group. Task 15 was identical to task 14 except the hidden object must be found by searching in reverse order. Associated development was not found.

Thus, the studies involving object permanence and linguistic skills vary in results and conclusions. Tomasello and Farrar (1986) suggest object permanence is a prerequisite to relational words; McCune-Nicolich (1981) show use of relational words before object permanence Stage VI. Research by Corrigan (1978) shows onset of Stage VI object permanence coinciding with the onset of single-word utterances, whereas Kelly and Dale (1989) found no such relationship. Dihoff and Chapman (1977) found a relationship between Stage V object permanence and the use of a few words, and the comprehension of words for absent objects; and in Stage VI the ability to talk about action, location and recurrence. Results of the study by Bates et al. (1977) indicate similar onset times of object permanence and referential speech. Finally, research by Gopnik and Meltzoff (1986) showed children who did better on object-concept tasks more often used disappearance words than those who did not.

Some research clearly indicates a specific relationship between particular stages of object permanence and particular language skills. Other research indicates

no relationship. While a few studies suggest that a particular language skill is dependent first on the development of a cognitive skill, others suggest a correlative relationship between cognitive and language skills.

Means-End/Causality

The development of means for obtaining desired environmental events thought to be closely associated with language development. For example, a child uses a stick (means) to get a ball out of a tube (end). Bates (1979) suggests tool use in solving a problem is analogous to using words to represent referents.

In a study of 30 children who were within 1 week of 18 months of age, Gopnik and Meltzoff (1986) found that children who demonstrated more advanced levels of means-end skill were more likely to use success/failure words, such as “there” or “uh-oh.” Unfortunately, the small number of children used in the study made it impossible to assess the results statistically.

In a second, longitudinal study, Gopnik and Meltzoff (1986) studied 19 children whose ages ranged from approximately 13 months to 19 months. They found a significant correlation between the age which children solve means-end tasks and when they begin to use success/failure words.

Kelly and Dale’s (1989) research described earlier also looked at means-end. When means-end skills were compared in Productive and Nonproductive Syntax Users Kelly and Dale found a significant difference. The majority of Productive Syntax Users passed a particular task in Stage VI that required the use of foresight. None of the Nonproductive Syntax Users passed this task. The authors suggest a relationship

between those who produce rule-governed sentences, a linguistic skill that might require planning, and the use of foresight in cognitive testing. It should be noted, though, that 1 single-word user also passed this task.

The results of these studies suggest a relationship between means-end/causality and language development might exist, but the exact nature of the relationship needs further study. Gopnik and Meltzoff (1986) suggest that development of success/failure words coincides with means-end development. Kelly and Dale (1989) propose a relationship between rule governed utterances and means-end.

Play With Objects

Play with objects is the fourth cognitive skill thought to be associated with language development. The terms “play,” or “play with objects” in this paper are used interchangeably with the terms “schemes” or “schemes for relating to objects” used in the Uzgiris and Hunt assessment scales. Both terms refer to how children perform actions or a sequence of actions in relation to different objects (McCormick & Schiefelbusch, 1990).

Kelly and Dale’s 1989 study looked at the relationship between play and early language. They found that the Single Word Users produced Level 3 of symbolic play. Level 3 involves a conventional action with at least one parent, experimenter or doll. Also, the Nonproductive Syntax Users produced Level 4 or 5 play, but the Single Word Users did not. Level 5 play involves: (a) the same conventional action performed on two or more different animate actors in sequence, and (b) two or more different conventional actions performed in sequence on the same animate actor other

than him/herself. Animate actors include parent, experimenter, doll of self. Level 5 play includes four types of behavior as defined by Kelly and Dale (1989): “a) a sequence of at least 3 conventional actions following the logic of a realistic scene and involving at least one animate actor; b) object substitution; c) search for relevant object/action; d) prior verbal announcement” (p. 650). These two levels are considered symbolic and representative of Piaget’s Stage VI. Children producing Level 4 and 5 cognitive skills, sequencing two or more play behaviors, were also producing combinations in their language. The Single Word Users produced only single elements in both play and language.

Casby and Ruder (1983) conducted a study to investigate the relationship of symbolic play and language development in both normal language-learning children and mentally retarded children. The subjects included 20 normal and 20 trainable mentally retarded children. Ten children in each group had a mean length of utterance (MLU) of less than 1.5 morphemes. The ages in the normal language group ranged from 19 to 26 months, while the age range in the retarded group was between 29 and 132 months. The other 10 in each group had an MLU of 1.5-2.0 morphemes, with ages ranging from 19 to 32 months in the normal group and 43 to 111 months in the retarded group.

Symbolic play was measured by observing the subjects play with different objects. A standard object was initially presented followed by objects which were less and less similar to the original standard object. For example, a telephone was presented, followed by a tinker toy with spools on each end, followed by a small

plastic doughnut, then no object, and finally a standard object with a different conventional use (double knowledge object condition), i.e. a comb was presented. A command was given, "Telephone, play telephone," with the presentation of each object. The behavior was scored as either present or absent.

The results showed significant differences in play between the less than 1.5 morpheme group and more than 1.5 morpheme group, except for the standard object. Second, there were significant differences between the object conditions except for the no-object and double object conditions in the less than 1.5 morpheme group. Third, the 1.5 to 2.0 morpheme group showed a significant difference between the standard object condition and the no object and the double knowledge object condition.

An analysis of the relationship between symbolic play and MLU showed that chronological age (CA) and MLU were positively related to symbolic play in the normal children. The mentally retarded children showed a positive relationship between symbolic play and MLU but not CA. The children beginning to use multi-word-utterances did significantly better with symbolic play than those at the single-word-utterance stage. There was no difference in symbolic play between the normal and mentally retarded group when matched for MLU level. This study indicates cognitive skill, in this case symbolic play, correlates with language production.

These studies support the theory that cognition influences language development. However, the results of the studies do not show just how cognition influences language development. Some studies demonstrated that children developed

a particular cognitive skill before achieving a particular level of language. For example, Tomasello and Farrar (1986) consider an understanding of object permanence to be a prerequisite to learning relational words. Other studies demonstrated a correlation between the development of cognition and language. Stage VI object permanence coincides with the ability to talk about action, location and recurrence according to Dihoff and Chapman (1977). Multi-word utterances coincide with more advanced symbolic play (Casby & Ruder, 1983).

Thus, all of the studies examining cognitive development and language development considered together present no conclusive evidence as to the influence of cognition on language. It is clear that cognitive skills, including a knowledge of object permanence, an understanding of means toward an end, and patterns of play with objects, are all related to language, but how they are related is not clear.

LANGUAGE AND COGNITION IN LANGUAGE DISORDERED CHILDREN

A study done by Kahn (1984) looked at the relationship between the cognitive skills of object permanence and means-end in relationship to language in children with disabilities. Twenty-four profoundly retarded children between the ages of 3 and 10 years were used as subjects. None of the children had any form of expressive communication. According to the Uzgiris-Hunt scales they were all functioning in the sensorimotor period. The children were divided into three groups of 8 children each. One group received object-permanence (OP) training, followed by language training.

A second group received means-end (ME) training followed by language training. The third group received language training only (LO). The training lasted for 20 minutes a day, 5 days a week, for 2 years.

The results indicated that the means-end and object permanence training help the majority of children learn to use speech. Their productivity ranged from 2 to 15 words spoken with no prompt or model. Of the eight children in the OP group five achieved speech. In the ME group six of the eight children acquired some speech. Their speech ranged from 7 to 31 words spoken with no prompts or models. In the LO group none of the children reached the speech phase. These results suggest an understanding of object permanence and means-end is a prerequisite for speech with the severely and profoundly retarded.

Terrell and Schwartz (1988) conducted a study to determine the relationship between language and three types of play: concrete, representational and symbolic. They used 30 children, all of normal intelligence: 20 normal children divided into two groups of 10, and 10 language-impaired children. Each language impaired child was matched to a child in each normal group on the basis of chronological age and MLU. After pretesting—during which a language sample was taken and a series of tests administered to determine language ability—the children were given toys for free play for approximately 15 minutes. Next they were given objects and a suggestion for a possible pretend activity, “Let’s put the baby to bed” (Terrell & Schwartz, 1988, p. 461). How the child interacted with the toys and objects was then judged to be concrete, representational or symbolic. (If the child used a doll and bed and

pretended to put the doll to bed it would be considered representational play. If the child took objects and used them to represent a doll and bed it would be considered symbolic play.)

The results indicated that the language impaired children performed more concrete activities than any other type of activities in comparison with the age-matched normal children. All children in all groups did perform some symbolic play, though. Another interesting result of the study was that the type of items supplied influenced how the children played. With toys the children performed more representational than symbolic play. This factor might be considered in interpreting the results of other studies.

A study done by Roth and Clark (1987) looked at the developmental relationship between language and cognition. The subjects included six language impaired-children and eight children with normally developing language. The language-impaired children ranged from 5 years 1 month to 7 years 10 months. They were matched to a normally developing group on the basis of means length of utterance (MLU), sentence development, and cognition. The normal language group ranged in age from 2 years 8 months to 3 years 2 months. Symbolic play was one of the specific areas studied. In comparison to the normal language subjects the language-impaired demonstrated deficits in symbolic play. For example, given toys and verbal cues the language-impaired subjects failed to put a doll to bed, use a doll's pillow appropriately, or relate a knife or fork to a plate.

The two groups of children were at the same linguistic stage, yet their cognitive development is significantly different. This is certainly evidence against a strong cognition hypothesis.

Folger and Leonard conducted a study in 1978 involving 28 children between 20 and 24 months of age. Twenty of the children were developing language normally while 8 were considered disordered because they had not met major language milestones at appropriate ages and were judged by speech language pathologists as having difficulty acquiring language. First, a pretest was given. This included measures of language and cognition and a language sample to determine each child's MLU. One week later two scales from the Uzgiris-Hunt were administered, including the means-end scale. An experimenter recorded each child's reactions as characteristic of a particular step or as some other action. The top step at which a child demonstrated a critical action was used as his score. The experimenter tried to elicit critical actions for at least two steps beyond the step the child failed.

The results of the study indicated no precise relationship between means-end abilities and whether the child was using single-word or two-word utterances. The 8 language-disordered children who produced one-word utterances did not differ in means-end ability from those who produced two-word utterances. This was also true for the normal language children when the age variable was controlled. The authors do concede that the majority of two-word stage children were at Stage VI on the means-end scale while the majority of single-word stage children were at the Stage V level. They go on to point out that there was an exception though, a child who did

use two-word utterances but had not attained Stage VI means-end. This exception, along with results from Ingram's 1978 study suggests that two-word utterances, or entry into the syntactic period is not dependent on Stage V means-end achievement.

Folger and Leonard's (1978) study also addressed play with objects. Again, when the age variable was controlled there was no significant difference between the children who used single-word or two-word utterances. They interpreted their results to show a very general relationship between early referential speech and sensorimotor abilities.

Rescorla and Goossens' (1992) research with toddlers and play with objects revealed that a delay in expressive language was accompanied by a delay in symbolic play. To compare symbolic play with language development they used forty children between 24 and 26 months of age, 20 with expressive specific language impairment (SLI-E) and 20 with normal language development.

The children participated twice in free play and twice in structured play situations with different toys. During free play the examiner did no more than redirect the child's focus if his attention wandered. During the structured play instruction and modeling were used. From a videotape of the session 18 types of behavior were recorded ranging from the most basic, "Wandering/Unoccupied" (no involvement with toys) to the most complex "Child-Initiated Social Interaction," which included a child "purposefully directing verbal or gestural requests to the adult" (Rescorla & Goossens, 1992, p. 1301).

The results show a delay in the development of symbolic play. The pretend play of the SLI-E children was “less advanced developmentally and less rich and varied in content” (Rescorla & Goossens, 1992, p. 1298) than the normal toddlers.

A study by Terrell, Schwartz, Prelock and Messick (1984) examined the relationship between symbolic play and language development. They studied 30 children, 15 with delayed language and 15 with normal language. The delayed children were between the ages of 2 years 8 months and 4 years 1 month. The language delayed children had the same range of intellectual abilities and no sensory deficits. The only difference was linguistic. The delayed group tested at least 1 year below their chronological age for expressive language and 6 months below their chronological age for receptive language. Expressive language, and receptive language for children under age 3 was measured by the Preschool Language Scale (Zimmerman, Steiner & Evatt, 1969). Receptive language for children over 3 was measured by the Test of Auditory Comprehension of Language (Carrow, 1973). The normal subjects were between 1 year 4 months and 1 year 10 months. The normal group was matched to the delayed group on the basis of linguistic development. According to parent information all children were single-word users with productive vocabularies between 25 and 75 words. While each child played at home with toys provided by the examiner a language sample of 100 utterances was collected and The Symbolic Play Test (Lowe & Costello, 1976) was administered.

Results showed the scores of the delayed group were significantly higher than the scores of the normal group. Eight of the delayed subjects had a higher raw score

than the highest raw score in the normal group. (Although the delayed subjects scored below what was expected for their chronological age.) The types of play schemas also revealed differences. Analyzing whether a particular play activity was doll-directed, self-directed, or other-directed, the delayed group used mostly (31 of 45) doll-directed activities. The normal group demonstrated an equal number of activities of each type.

These results do not indicate direct or immediate causal relationship between play and language. The language delayed subjects demonstrated more advanced play behavior than the normals yet their language was not as advanced as the normals. Again with this study an interaction between play and language seems to exist but the exact nature of the relationship is not clear.

Thal and Bates (1988) conducted a study to determine the relationship between symbolic gesture and language. Their subjects were between 18 and 32 months and considered late talkers—in the single-word stage of language acquisition. These subjects were matched to the normal language children for age and language. During a task where the subjects were expected to imitate a single gesture the late talkers performed like their language matched controls, but the age matched controls did significantly better on the number of gestures imitated. On a second task where the subjects were required to imitate a sequence of schemes such as feeding teddy—“Put teddy in chair. Put on bib. Feed Teddy an apple. Wipe teddy’s mouth” (Thal & Bates, 1988, p. 123)—the late talkers behaved more like their age-matched controls than their language-matched controls.

These studies support the theory that cognition influences language development. The subjects who had language deficits also demonstrated cognitive deficits. The direction of influence of these deficits, again as was true with the normal language children, is not clear. Kahn's (1984) study indicates cognitive skills are prerequisites to speech. The other studies show some cognitive skills correlated with language development. More concrete play, rather than representational play or symbolic play, was associated with the language-impaired as compared to age-matched controls. Yet results of Roth and Clark's (1987) study show language-impaired children performing at the same linguistic level with significantly different cognitive levels.

That language and cognitive development are somewhat independent of each other was also shown in a study by Wagener (1991). Examining the relationship between verbal and nonverbal responses on an infant development test at age 2 in relation to scores on an expressive language test 2 years later she found that normal talkers passed significantly more verbal items than late talkers, but there was no significant difference between the performance on nonverbal items. Also, Wagener's study showed no significant correlation between correct nonverbal responses at age 2 and expressive language scores at age 4 in the late-talking group.

CHAPTER III

METHODS AND PROCEDURES

METHODS

Subjects—Description at Intake

This study included 64 children divided into two diagnostic groups: normal and late talkers (LT). The subjects are involved in the Portland Language Development Project (PLDP) a longitudinal study of language development and delay. The late talkers (LT) were those who at 20-34 months of age used fewer than 50 different words by parent report on the Language Development Survey (LDS) (Rescorla, 1989) (see Appendices A and B.) The normal talkers were those who, at 20-34 months of age, used more than 50 different words by parent report on the LDS (Rescorla, 1989). The Language Development Survey is a vocabulary checklist completed by parents to identify language delayed toddlers. The list contains 309 different words divided into 14 semantic categories. The reliability, validity, sensitivity, and specificity for identifying language delayed toddlers is excellent according to four studies done by Rescorla (1989).

The LT subjects were obtained from three sources: (a) parents who took their babies in for well-baby check-ups at three private pediatric clinics during a 5-month period in the greater Portland area and who were asked to fill out a questionnaire

about their children's speech to indicate interest in participating in a longitudinal study (see Appendix C); (b) parents who responded to a radio broadcast concerning the study; and (c) parents who responded to a newspaper article describing the study. All normal subjects were recruited through the questionnaires distributed at the pediatrician's offices (see Appendix D).

Screening

In order to be eligible for the study each subject passed a speech reception screening at 25 dB using a visual reinforcement paradigm. A graduate student supervised by an audiology instructor, or the instructor, conducted the screening. Also, each subject in both groups scored 85 or higher on The Bayley Scale of Infant Development. The normal group was matched to the late talkers on the basis of race, sex ratio, and socioeconomic status (SES). Demographic data appear in Table II. All subjects were middle class.

The purpose of the study was explained to the parents orally and in writing. In order to participate in the study the parents signed a consent form and a permission form (see Appendix E).

PROCEDURES

Intake Assessment

The Uzgis and Hunt Scales of Infant Psychological Development (Dunst, 1980) was administered to each subject at the time of his or her entry into the study by a trained graduate student (see Appendices F and G). Procedures detailed in

TABLE II

SUMMARY OF DEMOGRAPHIC DATA

	Group 1 Normal Talkers ^a			Group 2 Late Talkers ^b			t
	Mean	<u>SD</u>	Range	Mean	<u>SD</u>	Range	
Age at intake ^c	25.0	4.3	19-24	25.3	4.0	19-33	.313
LDS (vocabulary size)	193.9	87.0	11-325	27.8	27.1	1-123	-10.943*
SES ^d	2.6	1.3	1-5	2.8	1.0	1-5	-.662
Age at follow-up ^c	50.3	2.4	48-58	51.0	3.5	41-61	-.781

^aPercentage of males equals 63%. ^bPercentage of males equals 76%. ^cAge in months. ^dBased on a scale of 1 to 5 with 1 being the highest socioeconomic status and 5 being the lowest (Myers & Bean, 1968).

*Significant beyond the .05 level of confidence.

Dunst (1980) were followed for administering and scoring the tasks. Age equivalent scores on the object permanence, means-end, causality and play with objects (schemes) subscales were calculated. Again, these particular subscales were chosen because of the previous research done revealing ability in these cognitive areas as somehow associated with language development. The imitation scale was not administered due to the difficulty of eliciting imitation behaviors reliably during a limited assessment session.

Follow-up Assessment

Subjects were seen yearly for re-evaluation of language and related skills.

At the follow-up evaluation at age 4, the Test of Language Development (TOLD) was administered by a graduate student (see Appendices H and I). Procedures detailed in the test manual were followed for administering and scoring this test.

Also at the follow-up a language sample was collected on audio-tape during a 15-minute free-play interaction between parent and child with a standard set of toys. The Developmental Sentence Score (DSS) (Lee, 1974) was used to analyze the grammatical complexity of the sample.

INSTRUMENTS

The Uzgis-Hunt Scales of Infant Psychological Development (Dunst, 1980) is a formal assessment of sensorimotor performance. It is an instrument which can be used to determine the cognitive or sensorimotor level according to Piagetian theory,

between 8 and 30 months of age. It contains seven subscales for examining sensorimotor performance: object permanence, means-end, vocal imitation, gestural imitation, causality, space, and schemes (play with objects). For each subscale the highest developmental attainment, scale step, stage placement, estimated developmental age (EDA), and deviation score can be derived. For example, on the object permanence scale a 12-month-old child whose highest developmental attainment is securing an object hidden with a single screen would have a scale step of 9, an EDA of 13 months, developmental stage of 5, and a deviation score of +1. The estimated developmental ages for subscales examining object permanence, means-end, causality, and schemes or play with objects were used to measure cognitive skills for the purpose of this study because of their relation to language development as indicated in the research literature.

Reliability and validity data on The Uzgiris-Hunt Scales of Infant Psychological Development are provided in the manual. Interobserver reliability between independent observers has been between .85 and .99. Test/re-test reliability was between .88 and .96. The scales were found to correlate significantly and substantially with developmental performance. It is not standardized, but age equivalents are given. Neither does The Uzgiris-Hunt Scales of Infant Psychological Development have a score which can be readily compared with a language score.

The Test of Language Development (Newcomer & Hammill, 1982) is designed to identify language delayed children and to identify specific linguistic strengths and weaknesses. The TOLD examines both expressive and receptive

language concerning semantics, syntax, and phonology. The seven subtests include listening subtests of picture vocabulary, grammatic understanding, and word discrimination; plus the speaking subtests of oral vocabulary, sentence imitation, grammatic completion and word articulation. The score for a speaking quotient (SPQ) and a listening quotient (LIQ) was used to measure expressive and receptive language, respectively. These were compared to cognitive scores.

The test manual states that the TOLD has an internal consistency of .80 and stability reliability of .99. Content, construct and criterion-related validity are reported as adequate.

The Developmental Sentence Score (Lee, 1974) is a standardized and norm referenced tool used to evaluate expressive language in preschool children (see Appendices J and K). The last 50 different utterances containing a subject and verb are analyzed and assigned a score. The utterances are divided into eight grammatical categories: indefinite pronouns, personal pronouns, main verbs, secondary verbs, negatives, conjunctions, interrogative reversals and wh-questions. Depending on the complexity of the structure points are assigned. Earlier emerging structures receive fewer points than later emerging or more advanced structures.

Reliability

Inter-rater reliability for administration of these procedures in the Portland Language Development Project was determined using the point-to-point method (McReynolds & Kearns, 1983). Approximately 10% of all scores were independently scored for inter-rater reliability. Reliability of scores on the Uzgis-Hunt was 100%.

Reliability on scoring the TOLD was 97%. Reliability of item scoring on the DSS was 92%.

STATISTICAL ANALYSIS

The question of whether there is a significant difference in cognitive scores between the normal and late talkers was answered by using a one-tailed t test for independent means with a .05 confidence interval. The t test compared the difference of means of the cognitive scores of the two groups.

The Pearson Product Moment Correlation coefficient with a .05 confidence interval was used to relate the cognitive score derived from the Uzgris-Hunt Scales of Infant Psychological Development taken at age 2 and expressive and receptive language scores derived from the Test of Language Development, and a Developmental Sentence Score (DSS) done on a language sample 2 years later at age 4. This correlation was calculated separately for each diagnostic group. This statistic determined whether there was a significant relationship or correlation between cognitive score at age 2 and expressive and receptive language ability 2 years later. In addition, correlations between the subscales of interest (object permanence, means-end, causality and play with objects) and expressive and receptive language were computed. These particular subscales measuring cognitive skills were chosen due to the number of studies completed showing some kind of association or relationship between them and language development.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

The first question of this study addresses whether there is a difference between the normal talkers and late talkers on an assessment of cognitive skills at age 2. A one-tailed t test for independent means with a .05 confidence interval was used to determine if there was a statistically significant difference between the means of the cognitive scores of the two groups. No significant differences were found (see Table III).

Normal talkers and late talkers were also compared on the language scores on the TOLD and DSS at age 4. Table IV shows a statistically significant difference was found between means for expressive language scores. Significant differences on the Developmental Sentence Score and the Speaking Quotient (SPQ) indicate the late talkers were still behind the normal talkers in expressive skills. The receptive scores at age 4 showed no significant difference between the normal and late-talking groups.

The second question of the study examined whether there is a relationship between cognitive scores at age 2 and language scores at age 4. Scores on the Uzgiris-Hunt scales at age 2 were correlated with the DSS and expressive and receptive language scores on the TOLD at age 4. The Pearson Product Moment

TABLE III

COGNITIVE AGE IN MONTHS FOR EACH GROUP
ON SUBSCALES OF DUNST PROCEDURE

Subscale	Group 1 Normal Talkers			Group 2 Late Talkers			t
	Mean	<u>SD</u>	Range	Mean	<u>SD</u>	Range	
Object permanence	19.7	3.1	15-23 ^a	18.9	4.3	8-23 ^a	-.803
Causality	20.8	.8	18-21 ^b	20.4	1.9	12-21 ^b	-.941
Means-end	25.5	1.3	20-26 ^c	24.3	3.1	11-26 ^c	-1.821
Schemes	21.8	2.9	14-24 ^d	20.5	4.2	14-24 ^d	-1.386

^aPossible range: 1-23. ^bPossible range: 2-21. ^cPossible range: 2-26. ^dPossible range: 1-24.

TABLE IV

LANGUAGE SCORES OF EACH GROUP AT FOLLOW-UP (AGE 4)

Measure	Group 1 Normal Talkers			Group 2 Late Talkers			t
	Mean	<u>SD</u>	Range	Mean	<u>SD</u>	Range	
DSS	7.1	1.4	4.1-10.7	6.0	1.9	2.4-10.6	-2.532*
LIQ	105.7	11.2	81-120	99.8	12.3	75-124	-1.974
SPQ	101.9	9.9	0-128	92.0	10.7	70-115	-2.331*

*Significant beyond the .05 level of confidence.

Coefficient of Correlation (Pearson r) was used to determine strength of the association between the cognitive scores and the language scores. These results show no significant correlations (see Tables V and VI).

DISCUSSION

The purpose of this study was to examine the relationship between cognition and language. Cognitive scores of late-talking and normal-talking children at age 2 were compared to each other. Also, this study examined whether there was a correlation between cognitive scores at age 2 and language scores at age 4.

The results indicate that the late talkers at age 2 were still behind normals in spoken language at age 4 even though their TOLD expressive score (SPQ) was within

TABLE V

PEARSON R COEFFICIENT OF CORRELATION BETWEEN
COGNITIVE AGE IN MONTHS ON DUNST SCALES
AT AGE 2 AND DSS AT AGE 4 IN NORMAL-
AND LATE-TALKING GROUPS

Subscale	Normal Group	Late-Taking Group
Object permanence	.29	.08
Means-end	.13	.15
Causality	.04	.14
Schemes	.19	.03

* Significant beyond the .05 level of confidence.

TABLE VI

PEARSON R COEFFICIENT OF CORRELATION BETWEEN
COGNITIVE AGE IN MONTHS ON DUNST SCALES AT
AGE 2 AND RECEPTIVE (LIQ) AND EXPRESSIVE
(SPQ) LANGUAGE SCORES AT AGE 4
IN NORMAL AND LATE-TALKING
GROUPS

Subscale	Normal Group	Late-Taking Group
Object permanence	.29	.08
Means-end	.13	.15
Causality	.04	.14
Schemes	.19	.03

* Significant beyond the .05 level of confidence.

the normal range. There were no significant differences between groups at the time of intake or follow-up in age, SES, or sex ratio, indicating the groups were well matched. There were no significant differences in receptive language skills (LIQ) at the time of follow up, indicating deficits in late talkers were restricted to expressive skills. The lack of significant differences on the cognitive scales suggests that late talking is a specifically linguistic deficit, not a result of general cognitive delay, although there may be a ceiling effect on the Uzgiris-Hunt tasks which were designed for 18-24 month olds. Most subjects were over 24 months at the time of testing. The lack of significant correlation between early cognitive and later expressive

performance again suggests independent language and cognitive development, although, as mentioned before, a ceiling effect may be operating.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

Significant evidence exists suggesting that early language development may be dependent or associated with early cognitive skills. If cognitive skills are prerequisite or are highly correlated with language development, then an instrument that could be used to accurately determine early cognitive skills would be valuable in predicting whether a child will be language-delayed or not.

The purpose of this study was to examine the relationship between cognitive skills as measured by Piagetian tasks at age 2 and linguistic development at age 4. The cognitive skills of object permanence, means-end, schemes, and causality were measured by using the Uzgiris-Hunt Scales of Infant Psychological Development. The estimated developmental age derived from this scale was examined in relation to the developmental sentence score and scores from a standardized language test.

The questions this study addressed were:

1. Is there a significant difference in the performance of the normal talkers and late talkers on the cognitive assessment at age 2?
2. Is there a significant relationship between the cognitive scores at age 2 and the language scores at age 4 in each of the diagnostic groups?

Subjects consisted of 64 children divided into two groups. They were all between the ages of 19 and 33 months of age. One group consisted of late talkers and the other group consisted of late talkers. Subjects were taken from part of a longitudinal study being conducted at Portland State University.

The instruments used to gather the data for this study were the Language Development Survey, the Uzgis-Hunt Scales of Infant Psychological Development, the Developmental Sentence Score (DSS), and the Test of Language Development (TOLD).

The Uzgis-Hunt Scales of Infant Psychological Development was administered at approximately 2 years of age and the TOLD at age 4. The DSS was derived from a language sample taken at approximately age 4 also.

Results of a one-tailed t test for independent means was used to answer the first question. The results indicated no significant differences on any cognitive scales between the normal and late-talking group.

The results of the t test did reveal a significant difference between the two groups on the DSS and the expressive language score on the TOLD, but not the receptive score.

The Pearson Product Moment Correlation r was used to answer the second question. Using a .05 level of confidence the results indicated no significant relationship between cognitive scores at age 2 and language scores at age 4.

CLINICAL IMPLICATIONS

Results of this study show only that children who are considered late talkers, as measured by the Language Development Survey (Rescorla, 1989) at age 2, score significantly lower than peers with normal language history on expressive language as measured by the DSS and the TOLD at age 4. Results did not show any relationship between cognitive skills as measured by Piagetian sensorimotor tasks at age 2 and language skills at age 4.

These results suggest that the Uzgiris-Hunt scales administered at age 2 are not a useful tool in predicting later language development. As discussed earlier this could be due to a ceiling effect in operation on the Uzgiris-Hunt Scales. Subjects in both groups reached the highest scores possible. The results do indicate that late-talking children at age 2 continue to lag behind the normal talking children at age 4, although language test scores were within the normal range.

Since the late-talking group and normal talking group in this study did not differ significantly in cognitive skills at age 2, cognitive skill training would not be indicated for them. These results suggest that children with language delays do not necessarily also have cognitive delays. Thus, children who are language delayed do not need more cognitive training but specific language intervention. They have the same cognitive ability of those who are talking significantly better than them but for some reason are lagging behind in expressive language. Since the deficit is specifically one of expressive language giving them intense language intervention only makes sense.

Ideally, intervention should be given to all of those who are behind in expressive language although they might test in the normal range by age 4. Language delays are considered a good predictor of later learning problems (Aram, Ekelman, & Nation, 1984). Eliminating or minimizing any language delay as soon as possible seems highly advisable.

The results of this study did not address individual cases. There was no significant difference in means of object permanence between the normal and late-talking group, but looking at the range of scores for means-end, for example, the lowest score in the late group was 9 months lower than the lowest score in the normal group. In practice it could be useful to look at a specific child's cognitive scores in relation to his language scores. If a child was not showing progress with language intervention alone and cognitive scores appear to be extremely low cognitive training might be indicated. Kahn (1984) clearly demonstrated the need for cognitive training with the profoundly mentally retarded. Those children who received language training only did not achieve speech, but those who received cognitive training along with language intervention did achieve speech.

RESEARCH IMPLICATIONS

Further research using the Uzgiris-Hunt Scales of Infant Psychological Development as a predictor of later language development needs to be done. Administering the scales at an earlier age might reveal more significant differences between the normal and late-talking groups. Siegel (1981) administered all scales of

the Uzgis-Hunt at 4, 8, 13, and 18 months of age and found they correlated significantly with cognitive and language development at 2 years of age. The scales showed a difference between the delayed and normal children at age 2. As stated earlier a ceiling effect may be operating on the Uzgis-Hunt since many of the children were over 24 months old when the scales were administered. This ceiling effect would be eliminated if the scales were given earlier.

Rescorla and Goossens (1992) suggest that children with expressive language delays might have a retrieval problem, that is they have the same language stored in memory but cannot easily get to and use it. This would explain why the children in this study had comparable receptive language scores but significantly different expressive scores. (Interestingly, the group with specific expressive language impairment in Rescorla and Goossens (1992) showed a marked difference in expressive and receptive language, unlike the normally developing toddlers.) More importantly, Rescorla and Goossens suggest a developmental difference between language delayed and normal developing children. Children with expressive language delays are at the lower end on a scale in regards to symbolic functioning. These symbolic deficits may not show up on the Uzgis-Hunt scales, thus the lack of significant findings in this study.

Casby and Ruder (1983) suggest the Uzgis-Hunt scales are not adequate measures of symbolic functioning. The Uzgis-Hunt "is more a scale of relational and functional play than symbolic play and provides a limited number of opportunities

for the child to respond with true symbolic play” (p. 405). This suggests a better tool for measuring this aspect of cognitive skill might be needed.

Considering the limitations of the Uzgiris-Hunt Scales of Infant Psychological Development research using a tool such as the one Rescorla and Goossens (1992) used could be useful. Their procedures for measuring symbolic functioning were modeled after Lowe’s Symbolic Play Test (Lowe & Costello, 1976). Casby and Ruder (1983) also offer a useful tool for measuring symbolic play. Numerous opportunities are provided for different levels of play and the scoring is completed as a particular type of play being absent or present.

Research to find a better tool to measure cognitive skills; research to determine the optimal time for administration of such a tool; and research to establish which cognitive skills are directly related to linguistic skills; all would help to establish more clearly exactly how cognition and language are related.

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APPENDIX A

LANGUAGE DEVELOPMENT SURVEY

Source: Rescorla, L. (1989). The language development survey.
Journal of Speech and Hearing Disorders, 54, 587-599, pp. 598-599.

Language Development Survey

Dear Parent,

We are engaged in research on expressive language development in 2-year-old children. We are especially interested in learning more about children who are slow in talking. We invite you to help us by completing this form and the vocabulary checklist on the back. Participation is entirely voluntary, and all information given will be strictly confidential.

Date _____ Your name _____	
Child's name _____ Birthdate _____	Sex _____ Age _____
Mother's name _____	Father's name _____
Address _____	Address _____
Telephone _____	Telephone _____
Date of birth _____	Date of birth _____
Marital status _____	Marital status _____
Level of education completed _____	Level of education completed _____
Employment:	Employment:
Not employed _____	Not employed _____
Employed part-time _____	Employed part-time _____
Employed full-time _____	Employed full-time _____
Occupation _____	Occupation _____
Please give age and sex of other children in family _____	
Has anyone in your family been slow in learning to talk? _____	
If so, who? _____	
Was your child premature? _____	
How many weeks early? _____	
How many ear infections has your child had? _____	
Is child in daycare or cared for regularly by babysitter? _____	
If so, how many hours per week? _____	
What language is spoken in your home? _____	
Please list languages spoken if other than English _____	
Are you worried about your child's language development? _____	

PLEASE COMPLETE VOCABULARY CHECKLIST ON THE REVERSE SIDE.

Please check off each word your child says. Don't include words your child can understand but not say. It's all right to count words that aren't pronounced clearly. Don't count words which your child repeats after you in imitation but does not say spontaneously.

Vocabulary Checklist

<u>Food</u>	<u>Animals</u>	<u>Actions</u>	<u>Household</u>	<u>Personal</u>	<u>Clothes</u>	<u>Modifiers</u>	<u>Others</u>
apple	bear	bath	bathtub	brush	belt	allgone	A,B,C, etc.
banana	bee	breakfast	bed	comb	boots	all right	away
bread	bird	bring	blanket	glasses	coat	bad	booboo
butter	bug	catch	bottle	key	diaper	big	byebye
cake	bunny	clap	bowl	money	dress	black	curse words
candy	cat	close	chair	paper	gloves	blue	here
cereal	chicken	come	clock	pen	hat	broken	hi, hello
cheese	cow	cough	crib	pencil	jacket	clean	in
coffee	dog	cut	cup	penny	mitten	cold	me
cookie	duck	dance	door	pocketbook	pajamas	dark	meow
crackers	elephant	diner	floor	tissue	pants	dirty	my
drink	fish	doodoo	fork	toothbrush	shirt	down	myself
egg	frog	eat	glass	umbrella	shoes	good	nightnight
food	horse	feed	knife	watch	slippers	happy	no
grapes	monkey	finish	light		sneakers	heavy	off
gum	pig	fix	mirror	<u>People</u>	socks	hot	on
hamburger	puppy	get	pillow	aunt	sweater	hungry	out
hotdog	snake	give	plate	baby		little	please
ice cream	tiger	go	potty	boy	<u>Vehicles</u>	mine	Sesame St.
juice	turkey	have	radio	daddy	bike	more	scuse me
meat	turtle	help	room	doctor	boat	open	shut up
milk		hit	sink	girl	bus	pretty	thank you
orange	<u>Body Parts</u>	hug	soap	grandma	car	red	there
pizza	arm	jump	sofa	grandpa	motorbike	shut	under
pretzel	belly	kick	spoon	lady	plane	stinky	welcome
soda	bottom	kiss	stairs	man	stroller	that	what
soup	chin	knock	table	mommy	train	this	where
spaghetti	ear	look	telephone	own name	trolley	tired	why
tea	elbow	love	towel	pet name	truck	up	woofwoof
toast	eye	lunch	trash	uncle		wet	yes
water	face	make	TV	Ernie, etc.		white	you
	finger	nap	window			yellow	yummy
	foot	outside				yucky	1,2,3,etc.
<u>Toys</u>	hair	pattycake					
ball	hand	peekaboo					
balloon	knee	peepee					
blocks	leg	push					
book	mouth	read					
bubble	neck	ride					
crayons	nose	run					
doll	teeth	see					
present	thumb	show					
slide	toe	sing					
swing	tummy	sit					
teddy bear		sleep					
		stop					
<u>Outdoors</u>	<u>Places</u>	take					
flower	church	throw					
house	home	tickle					
moon	hospital	walk					
rain	library	want					
sidewalk	McDonalds	wash					
snow	park						
star	school						
street	store						
sun	zoo						
tree							

Please list any other words your child uses here:

Does your child combine two or more words in phrases?

(e.g., more cookie, car byebye, etc.) yes _____ no _____

Please list below THREE of your child's longest and best sentences or phrases.

APPENDIX B

PARENT QUESTIONNAIRE

PARENT QUESTIONNAIRE

Dear Parents:

Please answer the questions on this form to the best of your ability. All answers will be held strictly in confidence and used for statistical purposes only. You need not put your full name anywhere on the form; only the child's first name, last initial and birth date are needed for identification purposes.

Today's date _____
 Child's first name _____
 Mother's address: _____

Child's birth date _____
 Child's sex _____
 Father's address: _____

Mother's telephone _____
 Mother's date of birth _____
 Mother's marital status _____
 Mother's level of education: _____

Father's telephone _____
 Father's date of birth _____
 Father's marital status _____
 Father's level of education: _____

Mother's employment:
 not employed _____
 employed part-time _____
 employed full-time _____
 occupation (past or present): _____
 gross income per year: _____

Father's employment:
 not employed _____
 employed part-time _____
 employed full-time _____
 occupation (past or present): _____
 gross income per year: _____

Please give sex and ages of the child's older brothers and sisters:

Please give sex and ages of the child's younger brothers and sisters:

How many hours per week is the child regularly cared for in daycare or by a babysitter? _____

What is the main language spoken at home? _____

If any other languages are spoken at home, please list them:

Were there any problems during your pregnancy with this child? If so, please list them: _____

Were there any problems (including prematurity) during the child's birth? If so, please list them (e.g., how many weeks premature was the birth?) _____

Were there any medical problems after birth? If so, please list them: _____

How many ear infections has the child had? _____

Is the child currently being treated for ear infections? _____

Has the child lived away from parents for more than a few weeks? If so, please explain: _____

Are you worried at all about the child's speech? _____

Has anyone in your family been slow to learn to talk? If so, who? _____

APPENDIX C

QUESTIONNAIRE FOR PARENTS OF CHILDREN 15-30 MONTHS OLD

Questionnaire for Parents of
Children 15-30 Months Old

What is your child's:

first name? _____

date of birth? _____

Mother's (or primary parent's) full name? _____

Mother's (or primary parent's) phone number? _____

Mother's occupation? _____

Father's occupation? _____

How many different words can your child say? (It's okay if the words aren't entirely clear, as long as you can understand them.)

none	_____	10-30	_____
less than 5	_____	30-50	_____
5-10	_____		

If your child says fewer than 10 words, please list them here:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Does your child put words together to form short "sentences"?

Yes _____ No _____

If yes, please give three examples here:

Would you be interested in participating in later parts of this study?

Yes _____ No _____

APPENDIX D

***OREGONIAN* ARTICLE**

Toddlers with delayed speech sought

A Portland State University researcher is looking for otherwise normal toddlers who begin talking late to serve as subjects in a study of delayed speech and its connection, if any, to later language problems.

Rhea Paul, a PSU assistant professor of speech communication, said the reasons for delayed speech in "late-blooming" young children and the early identification of toddlers who later will suffer chronic language delay had not been well-investigated, although perhaps 10 percent of American children may fall into those categories.

Paul is interested in studying children between the ages of 18 and 30 months in the Portland-Vancouver area who can say only five or fewer words, instead of the 50 or so most children can speak by that age. She

hopes to monitor their progress in speech development for two to five years, using such tools as speech tests and videotaped play sessions with their parents, to determine whether the children are indeed late-bloomers or whether their lack of early communication skills signals the start of severe speech and language delays.

Early identification of such children may allow early intervention and prevent future speech deficits, she said.

Paul's research is funded by the Fred Meyer Charitable Trust, the American Speech, Language and Hearing Foundation, and PSU. Parents who are interested in allowing their children to participate may contact Paul through the PSU Department of Speech.

The Oregonian, Portland, Oregon

APPENDIX E

INFORMED CONSENT AND PERMISSION FORM

INFORMED CONSENT

I, _____, hereby agree to serve as a subject in the research project on language development in young children conducted by Rhea Paul.

I understand that the study involves seeing my child yearly for speech and language evaluation and videotaping conversations between me and my child. I understand that these tapes will be transcribed for analysis of my child's spoken language patterns.

It has been explained to me that the purpose of the study is to learn whether children who begin talking late are at risk for later learning problems.

I may not receive any direct benefit from participation in this study, but my participation may help to increase knowledge which may benefit others in the future.

Dr. Paul has offered to answer any questions I may have about the study and what is expected of me in the study. I have been assured that all information I give will be kept confidential and that the identity of all subjects will remain anonymous.

I understand that I am free to withdraw from participation in this study at any time without jeopardizing my relationship with Portland State University.

I have read and understand the foregoing information.

Date: _____ Signature: _____

If you experience problems that are the result of your participation in this study, please contact the secretary of the Human Subjects Research and Review Committee, Office of Grants and Contracts, 303 Cramer Hall, Portland State University, 464-3417.

PERMISSION FORM

COLLEGE OF
LIBERAL ARTS AND SCIENCES

DEPARTMENT OF
SPEECH COMMUNICATION
SPEECH AND
HEARING SCIENCES

PORTLAND
STATE
UNIVERSITY
P.O. BOX 751
PORTLAND, OREGON
97207
503-229-3533

March 20, 1987

Dear Parents,

We are trying to learn more about the ways in which children develop an understanding of sentences, and compare the strategies normal children use with those used by children with disorders like mental retardation and autism. We would appreciate it greatly if you would allow your child to participate in our study, to be conducted at ECLC. Each child in the study will be taken from his/her classroom for 10-15 minutes and given a set of sentences to act out with toys (such as "Show me: the truck pushes the car.") Graduate students in speech-language pathology will conduct the testing under my supervision. Each child will receive a small gift for participating, and the school will receive a toy to thank the staff for their help. A brief summary of your child's performance on the task will be sent to you, for your information. Otherwise, all results will be kept strictly confidential.

Your cooperation in this study is completely voluntary and, if you decline to participate, the services your child receives at ECLC, Portland State University or anywhere else will not be affected in any way. If you choose to participate, you may withdraw at any time. While there will be no direct benefit to your child as a result of his/her participation, we think the results of the study will help us to understand better how normal children accomplish the task of learning language, and how children with disorders differ in their acquisition strategies.

If you would like to participate, please sign the statement below and return this letter to me in the enclosed envelope. If you have any questions at all please do not hesitate to call me at 229-3533. Thank you for your cooperation.

Yours,

Rhea Paul, Ph.D.
Assistant Professor

I give my permission for my child _____
whose preschool teacher is _____
to participate in the study described above.
Child's birthdate: _____

Parent's Signature

Date

APPENDIX F

UZGIRIS AND HUNT SCALES OF INFANT PSYCHOLOGICAL DEVELOPMENT: SUMMARY RECORD FORM

Uzgiris and Hunt Scales of Infant Psychological Development
SUMMARY RECORD FORM

Name _____ Sex _____
 Date of birth _____ Date of test _____
 Examiner _____
 Comments: _____

	Year	Month	Day
Date of test	_____	_____	_____
Date of birth	_____	_____	_____
Chronological age	_____	_____	_____
Chronological age (adjusted)	_____	_____	_____

Scale	Highest Developmental Attainment	Scale Step	Stage Placement	EDA	Deviation Score
Object Permanence					
Means-Ends					
Vocal Imitation					
Gestural Imitation					
Causality					
Space					
Schemes					

SUMMARY SCORES	
Stage Placements	
Mode	Range
EDAs	
Average	Range
Deviation Scores	
Average	Range

QUALITATIVE CHARACTERISTICS OF SENSORIMOTOR DEVELOPMENT

APPENDIX G

UZGIRIS AND HUNT INDIVIDUAL SCALE RECORD FORMS

I. VISUAL PURSUIT AND THE PERMANENCE OF OBJECTS

Child's Name _____

Date of Birth _____

Date of Test _____

SCALE STEP	AGE PLACEMENT (Months)	DEVELOPMENTAL STAGE	ELICITING CONTEXT	CRITICAL ACTION CODE	CRITICAL BEHAVIORS	SCORING					OBSERVATIONS
						1	2	3	4	5	
E ₁	1	I	Visual Fixation	—	Fixates on object held 8 to 10 inches above the eyes						
1	2	II	Visual Tracking	1d	Tracks object through a 180° arc						
2	3	II	Visual Tracking	2c	Lingers at point of object's disappearance—child in supine position or in an infant seat						
E ₁	4	III	Visual Tracking	—	Searches for object at point of disappearance—child seated on parent's lap						
3	5	III	Visible Displacement	3c	Secures partially hidden object						
4	6	III	Visual Tracking	2d	Returns glance to position above the head after object moves out of visual field						
E ₁	7	IV	Visual Tracking	—	Reverses searching for object in anticipation of reappearance—child seated on parent's lap						
E ₁	7	IV	Visible Displacement	—	Withdraws object held in hand following covering of hand and object with cloth						
5	8	IV	Visible Displacement	4d	Secures object hidden under a single screen						
E ₁	9	IV	Visible Displacement	5b	Secures object hidden with two screens (A & B)—hidden under A twice then B—searches under A only						
6	9	V	Visible Displacement	6c	Secures object hidden under one of two screens—hidden alternately						
7	9	V	Visible Displacement	7c	Secures object hidden under one of three screens—hidden alternately						
E ₁	10	V	Successive Visible Displacement	8e	Secures object hidden through a series of successive visible displacements with three screens						
8	10	V	Superimposed Screens	9c	Secures object under three superimposed screens						
9	13	V	Invisible Displacement	10d 10e	Secures object hidden with a single screen						
10	14	VI	Invisible Displacement	11c	Secures object hidden with two screens (A & B)—hidden under A twice then B						
11	14	VI	Invisible Displacement	12c	Secures object hidden under one of two screens—hidden alternately						
12	15	VI	Invisible Displacement	13c	Secures object hidden under one of three screens—hidden alternately						
13	18	VI	Successive Invisible Displacement	14c	Secures object hidden with three screens—object left under last screen—child searches along pathway						
E ₁	22	VI	Successive Invisible Displacement	14d	Secures object hidden with three screens—object left under last screen—child searches directly under last screen						
14	23	VI	Successive Invisible Displacement	15c	Secures object hidden with three screens—object left under first screen—child searches in reverse order						

III: DEVELOPMENT OF MEANS FOR OBTAINING DESIRED ENVIRONMENTAL EVENTS Child's Name _____ Date of Birth _____ Date of Test _____

SCALE STEP	AGE PLACEMENT (Months)	DEVELOPMENTAL STAGE	ELICITING CONTEXT	CRITICAL ACTION CODE	CRITICAL BEHAVIORS	SCORING					OBSERVATIONS
						1	2	3	4	5	
E ₁	2	I	Visual Awareness	—	Activity level increases or decreases on seeing a visually presented object						
1	2	II	Hand Watching	1b	Child engages in hand watching						
2	3	III	Secondary Circular Reaction	3c	Repeats arm movements to keep a toy activated						
3	4	III	Visually Directed Reaching	2b	Visually directed reaching—hand and object both in view						
4	5	III	Visual Directed Reaching	2c	Visually directed reaching—brings closed hand up to object						
E ₄	5	III	Visually Directed Reaching	2d	Visually directed reaching—shapes hand in anticipation of securing object						
5	7	IV	Multiple Objects	4c	Drops one or both objects held in hands to obtain a third object						
E ₁₀	8	IV	Barrier	—	Pushes obstruction (e.g., pillow or Plastiglas) out of the way to obtain an object						
6	8	IV	Support	6d	Pulls support to obtain an object placed on it						
7	9	IV	Locomotion	5c	Uses some form of locomotion as a means to obtain an out-of-reach object						
8	10	V	Support	7c	Does not pull support with object held above it						
E ₁₁	10	V	Support	—	Does not pull either of two supports with object placed between them						
9	11	V	String (horizontal)	8c	Pulls string along a horizontal surface to obtain an object attached to it						
E ₁₂	12	V	String (horizontal)	—	Pulls the correct one of two strings to obtain an object attached to one string						
10	13	V	String (vertical)	9e	Uses string vertically—pulls object up from floor						
E ₁₃	18	V	T-Stick	—	Uses T-stick as a tool to obtain an out-of-reach object						
11	19	V	Stick	10d	Uses a stick as a tool to obtain an out-of-reach object						
E ₁₄	19	V	Matchbox	—	Opens and removes the contents of a small matchbox						
E ₁₅	19	V	Necklace (container)	11d	Invents method to place the necklace into the container						
E ₁₆	19	V	Solid Ring	12c	Solid ring— attempts to stack avoids subsequently						
12	20	VI	Necklace (container)	11a	Shows foresight in placing the necklace into the container						
E ₁₇	20	VI	Matchbox	—	Shows foresight in placing a chain into a matchbox						
13	24	VI	Solid Ring	12d	Shows foresight by not stacking the solid ring						
E ₁₈	24	VI	Tube (clear)	—	Uses stick to push out a toy inserted in a clear tube						
E ₁₉	26	VI	Tube (opaque)	—	Uses stick to push out a toy inserted in an opaque tube						

IV: DEVELOPMENT OF OPERATIONAL CAUSALITY

Child's Name _____ Date of Birth _____ Date of Test _____

SCALE STEP	AGE PLACEMENT (Months)	DEVELOP. MENTAL STAGE	ELICITING CONTEXT	CRITICAL ACTION CODE	CRITICAL BEHAVIORS	SCORING					OBSERVATIONS
						1	2	3	4	5	
E ₁	2	I	Social Responsiveness	—	Vocalizes and/or smiles in response to adult talking						
1	2	II	Hand Watching	1b	Engages in hand watching						
2	3	III	Secondary Circular Reaction	2a	Repeats arm movements to keep a toy activated						
3a	5	III	Response to Interesting Spectacle	3c	Uses procedure as causal action in response to adult producing a repetitious action with toy (jumping jack, pinwheel, any string activated toy)						Action Presented _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Procedure Used _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Other Causal Action _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
3b	5	III	Familiar Game	4c	Uses procedure as causal action in familiar game situations (pulls to sit, pat-a-cake, tickling tummy)						Game _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Procedure Used _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Other Causal Action _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
3c	5	III	Spectacle Created by Agent	5a	Uses procedure as causal action in response to behavior created by an agent (no toy) (mimicking tongue, mouth sound, "booping" the nose)						Action Presented _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Procedure Used _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Other Causal Action _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
3d	5	III	Spectacle Created Using Toy	6b	Uses procedure as causal action in response to behavior created by an agent using a toy (Slinky, Farmer Says, whistling sound using a pop-bead)						Action Presented _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Procedure Used _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Other Causal Action _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
4a	10	IV	Spectacle Created by Agent	5d	Touches adult's hands as causal action—behavior created by agent—no toy						
4b	10	IV	Spectacle Created Using Toy	6a	Touches adult's hands or object as causal action—behavior by agent—using a toy						
4c	10	IV	Spectacle Created by Toy	7c	Touches adult's hands or object as causal action in response to adult activating a mechanical toy						
E ₁₁	12	V	Engages Adult	—	Pushes or pulls an adult's hands to have a behavior instigated or repeated						
E ₁₂	12	V	Repeats Behavior	—	Repeats behavior (shows off) to maintain adult attention						Behaviors Used: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
5	14	V	Engages Adult	6d 7d	Gives object to adult as causal action to have it activated						
E ₁₃	15	V	Gestural-Vocal Causal Behavior	—	Uses gestural plus visual/verbal behaviors to have an adult repeat or instigate a desired action						Gestures Used _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Vocalization _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
6	18	V	Spectacle Created by Toy	7a	Attempts to activate mechanical toy following demonstration						
7	21	VI	Spectacle Created by Toy	7i	Searches for causal mechanism needed to activate a wind-up toy (no demonstration)						

VI: DEVELOPMENT OF SCHEMES FOR RELATING TO OBJECTS

Child's Name _____

Date of Birth _____

Date of Test _____

SCALE STEP	AGE PLACEMENT (Months)	DEVELOPMENTAL STAGE	ELICITING CONTEXT	CRITICAL ACTION CODE	CRITICAL BEHAVIORS	SCORING					OBSERVATIONS
						1	2	3	4	5	
E ₁₁	1	I	Grasping Reaction	—	Grasps examiner's finger						
E ₁₂	2	II	Retention of Objects	a	Retains object placed in hands for 10 to 15 seconds						
1	3	II	Mouthing	b	Mouths objects placed in the hand						
2	3	II	Visual Inspection	c	Visually inspects objects held in the hands						
3	5	III	Simple Schemes	d ₁	Uses simple motor schemes (banging or hitting objects on a table surface)						
4	6	III	Simple Schemes	d ₂	Uses simple motor schemes (shaking, waving, etc.) independent of hitting a surface						
E ₁₄	7	III	Letting Go	—	Drops or throws objects—no visual monitoring of action						
5	7	III	Examining	e	Rotates objects, examining the various sides						
6	9	IV	Complex Actions	f	Uses complex motor schemes (slides, crumples, swings, tears, etc.)						
7	10	IV	Letting Go	g	Drops or throws objects—visual monitoring of results of action/terminal location of object						
E ₁₁	11	IV	Social Actions	h	Socially instigated actions—self and/or others						Actions Observed:
8	13	V	Social Actions	h	Socially instigated actions—inanimate objects						Actions Observed:
E ₁₃	14	V	Giving	—	Gives object to another person to instigate social interaction						Objects Used:
9	15	V	Showing	i	Shows objects (does not give) to others						Objects Used:
10	19	VI	Naming	j	Spontaneously names objects, persons, actions, etc.						Objects _____ _____ _____ _____ Persons _____ _____ _____ _____ Actions _____ _____ _____ _____
E ₁₅	24	VI	Symbolic Play	—	Symbolic play—uses one object as a signifier for another object (e.g., a stick for a spoon)						Signified _____ _____ Signifier _____ _____

APPENDIX H

DEVELOPMENTAL SENTENCE SCORE: SCORING CRITERIA

Lee, L. (1974). Developmental sentence analysis. Evanston, IL: Northwestern University Press.

The Developmental Sentence Scoring (DSS) Reweighted Scores

Score	Indefinite Pronouns or Noun Modifiers	Personal Pronouns	Main Verbs	Secondary Verbs
1	it, this, that	1st and 2nd person: <i>I, me, my, mine, you, your(s)</i>	A. Uninflected verb: <i>I see you.</i> B. copula, is or 's: <i>It's red.</i> C. is + verb + ing: <i>He is coming</i>	
2		3rd person: <i>he, him, his, she, her, hers</i>	A. -s and -ed: <i>plays, played</i> B. irregular past: <i>ate, saw</i> C. Copula: <i>am, are, was, were</i> D. Auxiliary <i>am, are, was, were</i>	Five early-developing infinitives: <i>I wanna see (want to see)</i> <i>I'm gonna see (going to see)</i> <i>Lemme [to] see (let me [to] see)</i> <i>Let's [to] play (let [us to] play)</i>
3	A. no, some, more, all, lot(s), one(s), two (etc.), other(s), another B. something, somebody, someone	A. Plurals: <i>we, us, our(s), they, them, their</i> B. these, those		Non-complementing infinitives: <i>I stopped to play.</i> <i>I'm afraid to look.</i> <i>It's hard to do that.</i>
4	nothing, nobody, none, no one		A. can, will, may + verb: <i>may go</i> B. Obligatory do + verb: <i>don't go</i> C. Emphatic do + verb: <i>I do see.</i>	Participle, present or past: <i>I see a boy running.</i> <i>I found the toy broken.</i>
5		Reflexives: <i>myself, yourself, himself, herself, itself, themselves</i>		A. Early infinitival complements with differing subjects in kernels: <i>I want you to come.</i> <i>Let him [to] see.</i> B. Later infinitival complements: <i>I had to go. I told him to go. I tried to go. He ought to go.</i> C. Obligatory deletions: <i>Make it [to] go.</i> <i>I'd better [to] go.</i> D. Infinitive with wh-word: <i>I know what to get.</i> <i>I know how to do it.</i>
6		A. Wh-pronouns: <i>who, which, whose, whom, what, that, how many, how much</i> <i>I know who came.</i> <i>That's what I said.</i> B. Wh-word + infinitive: <i>I know what to do.</i> <i>I know who(m) to take</i>	A. could, would, should, might + verb: <i>might come, could be</i> B. Obligatory does, did + verb C. Emphatic does, did + verb	
7	A. any, anything, anybody, anyone B. every, everything, everybody, everyone C. both, few, many, each, several, most, least, much, next, first, last, second (etc.)	(his) own, one, oneself, whichever, whoever, whatever <i>Take whatever you like.</i>	A. Passive with <i>get</i> , any tense Passive with <i>be</i> , any tense B. must, shall + verb: <i>must come</i> C. have + verb + en: <i>I've eaten</i> D. have got: <i>I've got it.</i>	Passive infinitival complement: With <i>get</i> : <i>I have to get dressed.</i> <i>I don't want to get hurt.</i> With <i>be</i> : <i>I want to be pulled.</i> <i>It's going to be locked.</i>
8			A. have been + verb + ing <i>had been + verb + ing</i> B. modal + have + verb + en: <i>may have eaten</i> C. modal + be + verb + ing: <i>could be playing</i> D. Other auxiliary combinations: <i>should have been sleeping</i>	Gerund: <i>Swinging is fun.</i> <i>I like fishing.</i> <i>He started laughing.</i>

Score	Negatives	Conjunctions	Interrogative Reversals	Wh-Questions
1	it, this that + copula or auxiliary is, 's + not: It's <i>not</i> mine. This is <i>not</i> a dog. That is <i>not</i> moving.		Reversal of copula: <i>Isn't it red?</i> <i>Were they there?</i>	
2				A. who, what, what + noun: <i>Who am I? What is he eating?</i> <i>What book are you reading?</i> B. where, how many, how much, what . . . do, what . . . for <i>Where did it go?</i> <i>How much do you want?</i> <i>What is he doing?</i> <i>What is a hammer for?</i>
3		and		
4	can't, don't		Reversal of auxiliary be: <i>Is he coming? Isn't he coming?</i> <i>Was he going?</i> <i>Wasn't he going?</i>	
5	isn't, won't	A. but B. so, and so, so that C. or, if		when, how, how + adjective: <i>When shall I come?</i> <i>How do you do it?</i> <i>How big is it?</i>
6		because	A. Obligatory do, does, did: <i>Do they run? Does it bite?</i> <i>Didn't it hurt?</i> B. Reversal of modal: <i>Can you play? Won't it hurt?</i> <i>Shall I sit down?</i> C. Tag question: <i>It's fun, isn't it?</i> <i>It isn't fun, is it?</i>	
7	All other negatives: A. Uncontracted negatives: I can <i>not</i> go. He has <i>not</i> gone. B. Pronoun-auxiliary or pronoun-copula contraction: I'm <i>not</i> coming. He's <i>not</i> here. C. Auxiliary-negative or copula-negative contraction: He <i>wasn't</i> going. He <i>hasn't</i> been seen. It <i>couldn't</i> be mine. They <i>aren't</i> big.			why, what if, how come, how about + gerund <i>Why are you crying?</i> <i>What if I won't do it?</i> <i>How come he is crying?</i> <i>How about coming with me?</i>
8		A. where, when, how, while, whether (or not), till, until, unless, since, before, after, for, as, as + adjective + as, as if, like, that, than I know <i>where</i> you are. Don't come <i>till</i> I call. B. Obligatory deletions: I run faster <i>than</i> you [run]. I'm <i>as big as</i> a man [is big]. It looks <i>like</i> a dog [looks]. C. Elliptical deletions (score 0): That's <i>why</i> [I took it]. I know <i>how</i> [I can do it]. D. Wh-words + infinitive: I know <i>how</i> to do it. I know <i>where</i> to go.	A. Reversal of auxiliary have: <i>Has he seen you?</i> B. Reversal with two or three auxiliaries: <i>Has he been eating?</i> <i>Couldn't he have waited?</i> <i>Could he have been crying?</i> <i>Wouldn't he have been going?</i>	whose, which, which + noun: <i>Whose car is that?</i> <i>Which book do you want?</i>

APPENDIX I

DEVELOPMENTAL SENTENCE SCORE: NORMS

Figure 1. Norms for Developmental Sentence Scoring (Reweighted)

APPENDIX J

RAW DATA

LATE TALKERS, Page A

#	age	lds	sex	ses	f/up	OP	ME	Ca	Sch	Avg	DSS	LIQ	SPQ
6	23	8	1	2	49	13	20	18	14	17	6.60	100	95
7	23	9	1	2	50	15	26	21	19	19	6.44	110	88
12	22	44	2	1	49	13	26	21	24	20	5.20	102	103
19	32	88	2	4	61	23	26	21	19	20	6.78	87	92
29	26	14	2	5	50	10	24	21	15	17	4.24	94	80
41	21	35	1	2	41	22	26	21	19	21	7.96	106	105
52	22	36	2	3	50	18	19	14	14	16	3.80	75	70
53	28	30	1	4	52	23	24	21	24	22	8.18	105	105
54	31	123	1	3	54	23	26	12	19	20	5.63	85	90
57	20	20	2	4	50	15	26	21	15	19	8.22	104	93
83	21	1	1	2	48	8	11	21	14	13	2.44	75	72
84	20	37	1	2	50	18	24	21	14	19	8.50	104	88
85	28	19	1	3	54	23	26	21	19	27	5.70	87	88
86	20	69	1	2	49	22	26	21	19	21	7.02	100	82
87	25	5	1	3	48	22	24	21	24	21	7.90	124	108
90	28	6	1	3	49	23	26	21	24	22	5.23	102	90
91	27	16	1	3	52	23	26	21	24	22	3.64	85	87
92	33	45	1	3	55	23	26	21	19	21	4.10	109	98
93	24	22	1	3	49	23	26	21	24	22	3.26	100	80

LATE TALKERS, Page B

#	age	lds	sex	ses	f/up	OP	ME	Ca	Sch	Avg	DSS	LIQ	SPQ
94	31	23	1	3	52	18	26	21	24	21	2.91	115	80
97	22	12	1	3	50	23	24	21	24	22	3.48	90	83
98	19	5	1	2	50	23	24	21	15	20	6.90	121	102
100	29	27	1	1	57	18	26	21	24	21	7.40	113	88
101	25	51	2	1	48	15	20	21	19	19	6.57	100	88
102	30	81	1	2	50	15	26	21	24	21	8.08	108	93
103	25	15	1	2	48	18	26	21	19	20	7.40	104	93
105	25	7	1	4	53	23	24	21	24	22	6.68	117	115
107	22	6	1	2	49	15	26	21	15	19	4.68	98	105
109	21	27	1	3	50	15	20	21	19	19	10.85	113	102
111	25	13	2	3	52	22	26	18	24	22	5.70	104	88
114	24	7	1	2	49	23	26	21	19	21	6.74	108	95
115	29	6	1	3	55	15	26	21	24	21	5.78	80	77
116	33	29	1	5	59	23	26	21	24	22	5.60	83	78
119	26	2	1	2	53	14	26	21	24	21	5.26	95	107
122	27	54	2	2	49	18	26	21	24	21	5.00	100	97
142	22	5	2	2	49	18	20	21	15	18	4.56	85	93

NORMAL TALKERS, Page A

#	age	lds	sex	ses	f/up	OP	ME	Ca	Sch	Avg	DSS	LIQ	SPQ
4	23	93	1	3	53	15	26	21	19	20	6.54	115	97
9	19	14	1	4	49	15	26	21	19	19	7.56	120	103
14	25	211	1	1	50	23	26	21	24	22	4.08	106	93
36	28	235	2	1	52	23	26	21	24	22	7.04	91	110
40	25	213	2	4	49	18	26	21	24	21	6.90	100	97
50	24	203	1	1	49	23	26	21	24	22	6.72	89	103
51	20	67	2	4	48	23	24	21	19	21	4.46	110	93
55	26	325	2	3	50	22	26	21	24	22	5.66	106	93
56	21	303	2	1	50	23	26	21	24	22	8.07	93	no score
58	34	263	1	1	58	18	26	21	24	21	8.04	117	107
59	34	263	2	1	57	22	26	21	24	22	8.64	106	113
63	19	144	1	3	49	15	26	21	24	20	6.33	115	117
72	20	145	1	4	51	18	26	21	19	20	6.70	87	97

NORMAL TALKERS, Page B

#	age	lds	sex	ses	f/up	OP	ME	Ca	Sch	Avg	DSS	LIQ	SPQ
78	26	121	1	4	50	23	26	18	19	20	6.00	95	98
81	26	279	2	5	50	23	26	21	24	22	7.82	96	120
95	19	11	1	3	50	18	24	21	14	19	5.58	100	103
113	26	257	2	3	51	22	24	21	24	22	6.60	115	128
128	27	247	1	2	48	18	24	21	24	21	5.71	104	92
130	29	222	1	3	52	18	26	21	24	21	8.62	117	112
131	31	257	1	2	49	18	20	21	19	19	8.08	119	103
132	20	102	1	1	49	18	26	21	19	20	8.04	109	113
133	27	239	1	4	48	22	26	21	24	22	8.46	100	97
138	23	96	1	4	51	15	26	21	19	20	7.68	81	108
139	29	274	2	2	49	18	26	21	24	21	10.72	117	118
141	22	173	1	1	49	15	26	18	19	19	8.64	115	115
144	24	197	1	4	49	23	26	21	19	21	6.20	115	118
150	28	281	2	1	49	23	26	21	24	22	6.82	117	102