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AN ABSTRACT OF THE THESIS OF Timothy Forest Lynn for the
Master of Science in Speech Communication with an emphasis
Speech-Language Pathology presented October 29, 1990.

Title: Otitis Media and Language Development in Late
Talkers.

APPROVED BY THE MEMBERS OF THE THESIS COMMITTEE:

Rhea Paul, Chair

Maria Montserrat-Hopple

Ann Fullerton

While there is agreement in the literature that otitis media is an extremely prevalent disorder among young children, there is disagreement as to the effect that otitis media has on language development. The lack of definitive research attests to the complexity of the issue and to the need for continued research.

This study examined the relationship between an early history of otitis media and the language development of

a group of "late talkers". The 28 toddlers in this group, while otherwise normal, were late to begin to speak. Each of the subjects was placed into one of two subgroups, depending upon their reported experience with otitis media. When the children were four years old, they were evaluated using the TOLD-P and a spontaneous speech sample. A similar group of 25 children who had a history of normal language development was also examined.

This study found that a reported history of otitis media did not constitute any additional risk of language disorder to the group of late-talking children. There were no differences in language outcome scores for OM subgroups within this group. However for subjects in the normal-language group, a negative history of ear infections was associated with significantly better receptive language scores. A significant difference between the socio-economic levels of children in the otitis media subgroups was found to have contributed to this result.

The study found no difference between the frequency of ear infections as reported by the parents of children in the normal and LT groups. However, children in the LT group had a greater family history of language delay than did children in the normal group. The study found no connection between a family history of language delay and a greater number of reported ear infections.

OTITIS MEDIA AND LANGUAGE DEVELOPMENT
IN LATE TALKERS

by
TIMOTHY FOREST LYNN

A thesis submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE
in
SPEECH COMMUNICATION:
with an emphasis in
SPEECH-LANGUAGE PATHOLOGY

Portland State University
1990

TO THE OFFICE OF GRADUATE STUDIES:

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CHAPTER I

INTRODUCTION AND STATEMENT OF PURPOSE

INTRODUCTION

Otitis media is the most common disease affecting children (Kenworthy, 1987). It is estimated that two out of every three children experience at least one episode of this middle ear disorder during their first three years of life, and that one in every three experiences three or more episodes by three years of age (Teele, Klein, & Rosner, 1984; Paradise, 1980).

Historically otitis media was considered a purely medical problem. The mild to moderate fluctuating hearing loss which often accompanies an episode of otitis media (Paradise, 1981) was not considered severe enough to compromise a child's language development. Early research such as that of Holm and Kunze (1969), prompted re-examination of the issue. This research suggested that children with histories of otitis media may be at risk of language delays. While many studies have since supported a relationship between otitis media and language development (Sak & Ruben, 1982; Teele et al., 1984), others have not (Roberts et al., 1986; Allen and Robinson, 1984). A

theorized association between otitis media and language development remains controversial (Roberts, Sanyal, Burchinal, Collier, Ramey, & Henderson, 1986; Roland, Finitzo, Friel-Patti, Brown, Stephens, Brown, & Coleman, 1989).

One point of agreement among those who have studied the relationship between otitis media and language development is the need for more research. Conflicting results can be attributed largely to the many confounding variables which may influence the hypothesized relationship (Menyuk, 1986). The effects of otitis media on language development seem to vary according to the population being examined (Lim, 1989). Among the groups which have not been adequately examined are those toddlers who, while "normal" in all other areas, demonstrated expressive language delays early in life. A reported history of frequent ear infections could be one factor determining which of these children is at risk of continued language problems.

STATEMENT OF PURPOSE

The purpose of this study was to explore the relationship between language development and an early history of middle ear involvement in a group of 4-year-old children who were late-talkers (LT) at age 2.

Specifically, scores achieved on the Test of Language Development-Primary (TOLD-P), as well as the mean lengths of utterances (MLU) of those children who had and had not experienced frequent episodes of otitis media prior to two years of age, were compared. The study attempted to answer the following questions:

1. How did the mean number of episodes of "ear infections" reported by parents of children in LT group compare to the number reported by parents of children in the normal-language group?
2. Within a group of 4-year-old children who demonstrated expressive language delays at age 2, were there significant differences in language skills between subgroups with and without histories of middle-ear involvement?
3. Within a group of 4-year-olds with no history of language delay, were there significant differences in language skills between subgroups with (OM+) and without histories of middle-ear involvement (OM-)?

Additionally, a post hoc examination of socio-economic status and family history of language delay was done in order to answer the following questions:

4. How did the socio-economic status of the subjects affect their OM group assignments and language skills?
5. Was there a correlation between a reported family history of language delay and either a history of ear infections or receptive language outcome scores?

DEFINITION OF TERMS

For the purpose of this study, the following

operational definitions were used:

1. Otitis Media with Effusion (OME): Inflammation of the middle ear in which fluid is present.
2. OM+: A positive history of otitis media.
3. OM-: A negative history of otitis media.
4. Ear Infections: A lay term for otitis media (Scheidt & Kavanagh, 1986).
5. Late-talkers (LT): Those children who, at the time of intake, either were 18 to 23 months of age and produced fewer than 10 words, or were 24 months of age or older and produced fewer than 50 words or no two-word combinations according to parent report.
6. MLU: Mean length of utterance as determined by averaging the number of morphemes a child uses per utterance in a 50-utterance language sample.
7. TOLD-P: The Test of Language Development-Primary (Newcomer & Hammill, 1982).

CHAPTER II

REVIEW OF THE LITERATURE

The first three years of life are of critical importance to the development of normal language. The first year is marked by certain social and cognitive abilities that a child must have in order to acquire normal language (Bates, 1976; Bowerman, 1974). The second year is marked by a rapid growth in vocabulary and the appearance of two-word utterances (Stoel-Gammon & Cooper, 1984; Brown, 1973). During the third year, a child's language develops rapidly in terms of form, content and use (Bloom and Lahey, 1978). The timely achievement of these developmental milestones presumes that a child has hearing within normal limits. However, the period within the first three years of life has also been observed to coincide with the peak incidence of otitis media (Klein, 1986).

EPIDEMIOLOGY

Otitis media occurs most often in early childhood, within the first three years of life (Menyuk, 1986). Roland et al. (1989) found that 73.5% of the 483 normal children they studied experienced at least one episode of unilateral otitis media between the time they were 6 and 18 months

of age. Approximately one half of the episodes were bilateral. In a study of 488 children from a general pediatric population who were followed from birth to 72 months of age, Howie, Ploussard, and Sloyer (1975) found that 67% experienced at least one episode of otitis media and 61% experienced their first episode prior to age two.

Those who experience their first episode of otitis media early in life are more likely to experience recurrent episodes of greater severity than those who experience their first episode later in life (Teele et al., 1984). Otitis media is less frequent in children older than three years of age (Howie & Schwartz, 1983) and is uncommon in children who are 7 years old or older (Klein, 1986).

The duration of each episode of otitis media can vary from a few days to several months (Paradise, 1981). Roberts et al. (1986) reported that of the 61 socio-economically disadvantaged subjects the number of days of unilateral or bilateral otitis media with effusion (OME) experienced in the first 3 years of life varied from 8 to 931 days. Teele et al. (1984) used 29 days as an estimate of the average duration of an episode of OME.

Bess (1986) reported that between 26% and 55% of the children who experience otitis media with effusion experience an associated hearing loss within the speech frequencies. While some episodes of OME have no effect

upon hearing levels, others could be accompanied by losses of as much as 50 dB HL or more (Bess, 1986). In a study of 762 children, Fria, Cantekin, and Eichler (1985) found the mean speech reception threshold level associated with OME was 22.7 dB HL. Once an episode of OME is resolved, hearing levels generally return to normal (Menyuk, 1986).

In summary, OME is a common disease which is most prevalent in children from birth to 3 years of age. Those children who experience OME early in life are at highest risk of recurrent and persistent experiences with OME. Recurrent otitis media with early onset is often associated with mild fluctuating hearing loss.

THEORETICAL MODEL

The main body of research concerning the effects of otitis media on language development is based upon a theoretical model which hypothesizes a direct relationship. This model proposes that otitis media leads to mild fluctuating hearing loss which interferes with the reception of linguistic input. The degraded auditory input can lead to delayed language development which can have both short and long-term effects on language (Feagans, Blood, & Tubman, 1988).

The model hypothesizes that mild hearing loss can even affect a child during the prelinguistic period because

it interferes with speech perception. A newborn infant who is developing normally is capable of discriminating speech from other sounds in the environment (Morse, 1979) and by two months is capable of discriminating different speech sounds (Owens, 1988). A mild hearing loss can affect the child's development of these auditory skills (Welsh, Welsh, & Healy, 1983), which could have serious implications for language development.

The hearing loss associated with otitis media has the greatest effect upon those consonants which are in the high and low frequency range and which are produced with the least amount of speech energy (Dobie & Berlin, 1979). Consequently, children may be unable to hear voiceless stop consonants and voiceless fricative sounds. Children may miss unstressed function words as well as plural markers, tense markers, and other morphological word endings (Dobie & Berlin, 1979). As the result of missed linguistic information, children may have difficulty acquiring word meanings, formulating grammatical rules, and perceiving subtle meanings conveyed by prosody (Northern and Downs, 1984).

Another dimension of this model involves the fluctuating nature of the hearing loss associated with recurrent episodes of otitis media. It has been proposed by some researchers (e.g. Feagans, 1986; Menyuk, 1980)

that the effects of a fluctuating hearing loss may be even more detrimental to a child's language development than a stable loss of the same severity. These children do not have a stable input base from which to infer the rules of language. Input may be inconsistent and therefore difficult to categorize (Menyuk, 1979).

OTHER THEORETICAL MODELS

A second model hypothesizes an indirect relationship between otitis media and language delays. Variables such as the general effects of illness and attention deficits may mediate the relationship. Otitis media often accompanies upper respiratory infections (Henderson, Collier, Sanyal, Watkins, Fairclough, Clyde, & Denny, 1982). This model proposes that children who experience chronic illness may be less alert to environmental input than are healthy children. This lack of attention can be expected to impact on learning and development (Feagans et al., 1988).

A third model combines both of the previous models, predicting that children's language will be impacted by degraded language input as well as by variables such as poor attention skills. While the former will affect basic language skills, the later will affect higher-level language skills. This model predicts that children may soon recover

from delays in basic language skills which are due to degraded language input, but those delays which are due to poor attention to language may be long lasting.

ADDITIONAL INFLUENCES

The influence of certain primary variables must be considered in every theoretical model. Since not every child who experiences otitis media will experience developmental disorders, other related factors must exist. Various authors have suggested certain intrinsic and extrinsic variables which are thought to influence the relationship between otitis media and language development.

Among intrinsic factors which may add to the risk of language delays are the child's age, sex, handicapping conditions, and the number and frequency of episodes of otitis media (Feagans et al., 1988). The child's IQ, visual status, health history, and nutritional status are also reportedly linked to increased risk (Matkin, 1986).

External factors include the child's school and home environments and social-economic status (Feagans et al., 1988). Birth order, parent-child interaction, and language exposure may be important variables (Matkin, 1986). A family history of language disorders has also been proposed as a possible risk factor (Bishop & Edmundson, 1986).

EXPERIMENTAL EVIDENCE

The body of research concerning the effect of otitis media upon language development is inconclusive and contradictory. While a number of researchers have reported results which tend to support a relationship, others report the opposite. Authors such as Paradise (1981) have questioned the validity of many of the studies, pointing out weaknesses in research design and methodology.

Prospective studies of the effects of otitis media are relatively recent and rare. The majority of research is retrospective in nature. While retrospective studies, as a whole, tend to support a relationship between a history of otitis media and delayed language skills, the results of prospective studies are mixed (Feagans et al., 1988).

Studies Indicating an OM/Language Connection

In a classic study by Holm and Kunze (1969), 16 children between the ages of 5 and 9 years old were studied. These children had histories of recurrent ear disease before they were two years old. When compared to a well-matched control group without such histories, the experimental group scored significantly lower on expressive and receptive language tests but did not differ on tests requiring visual and motor skills. Kaplan, Fleshman, Bender, Baum, and Clark (1973) completed a 10 year longitudinal study of

489 Eskimo children (a population which has been found to have a high incidence of OME). The children were followed from birth. Those who had experienced chronic otitis media before they were two years old scored lower on language measures than did those who had no such histories. No differences among the groups were found on measures of non-verbal I.Q.

Friel-Patti, Finitzo-Hieber, Conti, and Brown (1982) studied intensive-care infants from low socio-economic groups. The Sequenced Inventory of Communication Development (SICD) and the Receptive Expressive Emergent Language were used to assess groups with and without histories of OME. While 43 percent of the children in the OME group demonstrated language delays, only 7 percent of the group with no history of middle ear involvement demonstrated comparable language delays.

Zinkus (1986) reported the results of a series of studies in which children with confirmed histories of otitis media during the first three years of life were compared to a group of children with no such histories. Children in the otitis media group were reported to have acquired their first words significantly later than those children in the control group. The otitis media group also acquired three-word phrases significantly later than the group without an early history of otitis media.

Friel-Patti and Finitzo (1990) monitored the number of days that a group of children from families of mid to high-middle socio-economic status spent with OME between the time they were 6 and 18 months of age. Hearing levels were also monitored. Language was assessed at 6-month intervals from 1 to 2 years of age. The authors concluded that a direct relationship exists between OME and hearing levels and between hearing levels and emerging language. The number of days of effusion negatively correlated with receptive language at 12 months and with expressive language at 18 months.

Studies Finding a Connection with Expressive Language Only

Several studies report that the effects of OME are limited to expressive language. Wallace, Gravel, McCarton, and Ruben (1988) examined the language development of 27, one-year-old infants. High-risk and full-term infants were included in the study. Based on results of regular medical evaluations, children were assigned to either an otitis free group or an otitis positive group. While receptive language skills of the infants in the otitis positive group did not differ significantly from those of the otitis free group, expressive language skills did.

Preliminary results of a prospective, longitudinal, and randomized study being conducted by Rach, Zielhuis,

and Broek (1988) indicated that children with histories of chronic persistent bilateral OME performed below standard on expressive language tasks, while their performance on receptive tasks was age appropriate. Additionally, a long history of OME was found to have a greater impact on expressive language development than a shorter history.

Downs, Walker, Northern, and Gugenheim (1988) conducted random audits of the case files of 1,200 children between birth and 3 years of age. Of these children, 657 between the ages of 12 and 36 months were given the Early Language Milestone Scale (ELM). More than 6 episodes of otitis media was found to be significantly related to failure on the expressive language portion but not to failure on the receptive portion of the ELM.

Studies Finding a Connection with Receptive Language Only

While relatively few in number, there are studies which report that receptive language alone was impacted by otitis media. Silva, Kirkland, Simpson, Stewart and Williams (1982) compared a group of 47 five-year-old children with OME to a control group of 355 children. While a significant difference was found in verbal comprehension, none was found in verbal expression.

Menyuk (1986) found that when socio-economic groups were collapsed, the only significant difference between

the language performance of 3-year-old subjects who had experienced few, some, and many days of OME was in word comprehension. When the groups were separated into low and middle socio-economic groups, however, the middle socio-economic group differed significantly between OME groups in both receptive and expressive measures. This difference was not found between OME groups from low socio-economic families. Scores achieved by the low SES children were lower than those of middle SES children, however the scores did not seem to be influenced by experience with otitis media.

Studies Finding No OM/Language Connection

Unlike the studies mentioned above, some studies fail to support a relationship between early OM and later language development. Roberts et al. (1986) studied 61 children from low socio-economic backgrounds. These children were monitored for episodes of OME during their first three years of life. The children were divided into three severity groups according to the number of days they had spent with OME (less than 88 days, 8-181 days, and more than 181 days). Verbal and academic performance was evaluated on the basis of scores achieved on standardized tests administered when the children were between 3½ and 6 years of age. No relationship was found between OME history and subsequent verbal and academic performance. In a follow-up study

(Roberts et al., 1989), the 41 children from the original pool who had completed 3 years of school were evaluated for cognitive performance, academic achievement, and classroom behavior. No statistically significant relationships were found between OME during the first three years of life and performance on verbal intelligence and academic achievement measures during the third year of school.

Hubbard, Paradise, McWilliams, Elster, and Taylor (1985) used the verbal subtest of the Revised Wechsler Intelligence Scale for Children to measure the language competence of two matched groups of children with cleft palate. One group received treatment from a hospital which used early and aggressive otologic management. The other group received treatment from a hospital which used a more conservative treatment approach. The group which received aggressive management demonstrated better hearing acuity and articulation skills than did the second group. However, the two groups performed similarly on the language measures.

Allen and Robinson (1984) studied 276 children who were between the ages of 30 and 48 months. Middle-ear status was judged by impedance screening. Previous history of OME was not considered. All children were assessed for language development using the SICD. No relationship

between impedance data and performance on the standardized language assessment was found.

Long-Term Outcome Studies

If an early history of OME does have an adverse influence on early language acquisition, it is possible that the influence is short lived. These children may be resilient enough to compensate for any delays in their acquisition of language skills once their hearing thresholds return to normal. Research concerning long-term outcomes is inconclusive.

In a prospective case control study, Lous et al. (1988) examined 435 three-year-old children to determine their otologic status. From this cohort, 26 children were selected as a subject group and 26 were selected as a matched control group. When the children were 8 years old, they were given an assessment battery which included the PPVT-R and the WISC-R. No significant differences were found between the case and the control groups. This study did not take into account the history of otitis media prior to age 3.

Silva, Chalmers, and Stewart (1982) examined 879 five-year-old children. Forty-seven children were determined to have bilateral OME. A significant difference was found between groups in the area of verbal comprehension. In a longitudinal follow-up study (1986), the children were

assessed at ages 7 and 9. Significant differences in language skills were found at these ages as well.

There may be a critical number of episodes of OME that a child can experience beyond which adverse affects on language will continue. As part of the on-going research of the Greater Boston Otitis Media Study Group, Menyuk (1986) reported the results of a battery of test administered to a group of 7-year old children who had been regularly evaluated from three months of age for middle-ear involvement. Children who had experienced four or more episodes of OME during each of the first three years of life (more than 108 days) demonstrated expressive language deficits at 7 years of age. Those who experienced fewer episodes of OME during their first 3 years of life did not experience language problems at 7 years of age.

Studies Concerning Related Factors

Socio-economic Status. Teele et al. (1984) examined the correlation between the time spent with OME and performance on standardized language tests in 205 three-year-old children. Children from higher socio-economic groups who had spent a greater number of days with middle-ear effusion scored significantly lower than those of the same SES who had spent fewer days with OME. This correlation was not found among children of lower socio-economic groups. These results were contrary to

other studies which showed a greater impact on children from low socio-economic backgrounds (Roach & Rosecrans, 1971; Friel-Patti et al., 1982).

Family History. Bishop and Edmundson (1986) suggest the possibility that a number of factors in the child's history combine to place a child at risk of developmental language disorders. They report the results of a study in which 69 four-year-old children with specific developmental language disorders were compared to a control group. Parents of all children were asked to complete a questionnaire concerning their child's birth, medical, and language history.

No significant difference was found between the reported incidence of otitis media among the language-disordered group and the control group. Although perinatal risk factors occurred along with otitis media in the language-disordered group and not in the control group, these factors could not account for the majority of cases. They did observe, however, that many of the children in the language-disordered group had in common a reported history of language disorder among first degree relatives, suggesting the need for further reasearch.

SUMMARY

A review of the literature indicates that there is

a lack of definitive evidence surrounding the relationship between otitis media and language development. There may be a complex interaction between otitis media and other variables. Determining whether a history of otitis media increases the risk of language delay in a group of children who are already at risk because of slow speech development may lead to better understanding of this interaction.

CHAPTER III

METHODS

SUBJECTS

The 53, four-year-old children in this study are participants in an on-going, longitudinal study being conducted at Portland State University. These children were first evaluated at two years of age after which they were designated as either "late" or "normal" speakers, based upon their expressive vocabularies as reported on a parent questionnaire (Appendix A).

Children who were between the ages of 18 and 23 months at the time of intake were included in the late-talkers (LT) group if their parents reported that they produced fewer than 10 different words. Children who were 24-34 months of age were included in the LT group if their parents reported that they had expressive vocabularies of less than 50 words, or that they used no two-word combinations. Children whose vocabularies exceeded the above criteria were included in the Normal-language group.

Subject Recruitment

Three methods were used to recruit subjects for the ongoing study. The first method was to distribute

questionnaires to three pediatric clinics within the Portland Metropolitan area. Questionnaires were distributed by nurses or receptionists to parents who brought their children for well-baby visits. In addition to information about their children's expressive vocabularies, the questionnaire asked parents if they would be interested in participating in later parts of the study.

The second method was to broadcast announcements over a local radio station explaining the study and requesting subjects. The final method was to publish an article in the Oregonian newspaper describing the study and requesting subjects. Those parents who responded to either the radio or newspaper announcement were contacted by telephone at which time they were asked the questions on the questionnaire. Responses were recorded on the response form by the interviewer.

All children who met the criteria for the LT group were invited to participate in the study. A group of subjects was then selected from the pool of interested normals to match the LT group in terms of sex, age, race, socio-economic status and birth order. Parents then brought their children to Portland State University for an intensive intake assessment.

Description of Subjects

Twenty eight of the children who were placed in the

LT group at age two participated in the follow-up study when they were four years of age. Twenty five of the children in the normal group participated in the follow-up study. Demographic characteristics are displayed in Table I. The average age at intake of the subjects in this study was 26 months. They were middle class in terms of socio-economic status. The subjects included 16 females and 37 males and the majority were Caucasian. Comparisons between the Normal-language group and the LT group for each of these characteristics revealed that the groups differed significantly only in terms of expressive vocabulary size.

PROCEDURES

Intake Procedures

During the first of three intake sessions, the study was explained orally and in writing to the parent of each subject and the parent signed a form (Appendix B) giving permission for that child to participate in the study. The parent then completed a questionnaire concerning socio-economic status and the child's medical history, including information about the child's history of ear infections (Appendix C). Extensive language assessments were also conducted during this visit.

TABLE I
DEMOGRAPHIC CHARACTERISTICS

	NORMAL	LT	SIGNIFICANCE?
Age at intake			
Mean	25.5	26.2	NO
S.D.	4.1	3.9	
Range	19-34	19-33	
SES*			
Mean	2.4	2.9	NO
S.D.	1.3	1.0	
Sex			
Male	60%	79%	NO
Race			
White	96%	96%	NO
Expressive Vocabulary (LDS)			
Mean	205.0	23.1	YES
S.D.	78.7	28.7	

* Based on a scale of 1 to 5 with 1 being the highest socio-economic status and 5 being the lowest.

Parents also completed the Language Development Survey (LDS) (Rescorla, 1989). The same criteria for group assignment which were applied to vocabularies reported on the initial parent questionnaire were applied to vocabularies reported on the LDS. Children were included in the LT group only if they continued to meet these criteria. Children who were 18 to 23 months of age were included in the LT group if they produced fewer than 10 different words and children who were 24-34 months of age

were included in the LT group if they produced less than 50 words, or used no two-word combinations.

The second session included a hearing screening. Audiometric screening was performed in a sound booth in sound field using speech stimuli and visually reinforced audiometry. Subjects were screened at 15 dB HL. Thresholds were obtained for subjects who failed the screening test at 15 dB HL. Screenings were either performed by a certified audiologist or by a graduate student of audiology under the supervision of a certified audiologist. Tympanometric screenings were performed during the same session.

During the final assessment session the Bayley Scales of Infant Development (Bayley, 1969) was administered by a psychologist. Each of the subjects demonstrated normal intellectual functioning by obtaining a score of 85 or better. Subjects were screened informally for signs of neurological impairment, autism, and any disability which might preclude normal language development.

Outcome Procedures

As part of the longitudinal study, each child was evaluated again at age four. The average age of the subjects during these follow-up evaluations was 51 months (s.d. 3.03). There was no significant difference between

the mean age of subjects in the Normal-language group and those in the LT group.

Testing was performed by a graduate research assistant. The Test of Language Development-Primary (TOLD-P) (Newcomer & Hammill, 1982) was administered in accordance with the procedures specified in the test manual. Scores were calculated and recorded by the same research assistant.

A fifteen-minute spontaneous speech sample during which the child interacted with his or her mother was also obtained. A standard set of toys was provided and the mother was instructed to allow the child to play with the toys "as s/he likes and just talk to him and play as you would if you were at home". Mother and child were seated at a table in a clinic room at Portland State University. The interaction was recorded on audio tape. An orthographic transcription was then made from the audio tape and mean length of utterance was calculated according to Brown's (1973) rules.

Procedures for Present Study

The present study analyzed data collected during the intake and outcome assessments mentioned above. Children within each diagnostic group were further divided into an otitis media positive (OM+) and an otitis media negative (OM-) group based upon information provided on the parent questionnaire (Appendix C) in conjunction with audiologic

information obtained during the intake evaluation.

Since the medical history questionnaire was designed for the larger longitudinal study and not specifically for the present investigation, it was general in nature and included only two questions specifically related to ear infections. These were:

1. How many ear infections has your child had?
2. Is the child currently being treated for ear infections?

The questionnaire also asked the parent to list any medical problems. Those responses to the first question which were other than a single number were interpreted as follows:

1. If a range of values was given, the mean value rounded to the nearest whole number was used.
2. If two consecutive numbers were reported (i.e. 2-3), the higher value was assigned.
3. "Many" and "chronic" were assigned a value of 10 episodes. Precedent for assigning this arbitrary value was set by Bishop and Edmundson (1986).

Children were included in the OM+ group if they met one of the following criteria:

1. Parent reported that the child had a history of 6 or more infections.
2. Parent reported that the child had ventilation tubes placed in one or both ears at some time prior to intake.
3. Parent reported that the child had a history of at least 3 ear infections, and in addition the child failed a speech reception screening at 15dB HL and had an abnormal tympanogram for one or both ears at the time of intake.

Children who met none of the criteria for the OM+ group were assigned to the OM- group.

These criteria are modified from indicators used in a study by Shriberg and Smith (1983). The criteria used for this study were designed to differentiate those subjects who were likely to have experienced frequent and persistent episodes of otitis media from those who had a history of infrequent episodes. Six ear infections was selected as a cutoff because it marked a natural break in the distribution of values reported by parents and is comparable to the number used in other studies (Down's et al., 1988; Zinkus and Gottlieb, 1980; Brandes and Ehinger, 1981).

A report of ventilation tube placement irrespective of the number of reported ear infections was considered an adequate indication of a history of otitis media since surgery presumably would not have been performed without such a history. Information concerning myringotomy tubes was obtained from the parent questionnaire or from information provided by the audiologist based upon otoscopic inspection prior to tympanometry.

An abnormal tympanogram and failure to pass a hearing screening at the time of the initial intake evaluation were indications that the child might have been experiencing an episode of otitis media. Since this was objective

evidence it was weighted more heavily than the parent's report of ear infections.

The term "ear infections" is a lay term for otitis media (Scheidt & Kavanaugh, 1986). It is not used as a synonym for serous otitis media, which is the term used to specify the presence of infected fluid in the middle ear. Children often experience episodes of OM without showing any signs of discomfort (Marchant et al., 1984; Schwartz et al., 1981). It is likely that these silent episodes would go undetected by parents leading to under reporting on parent questionnaires.

Tympanograms were interpreted by this researcher using Jerger's classification system (Jerger, 1970). A tympanogram with a flat curve and no measurable compliance peak was classified type B. A tympanogram showing middle ear pressure more negative than -100 mm H₂O or more positive than +100 mm H₂O were classified type C. Type B and C tympanograms were considered abnormal when considering children for OM+ groups.

INSTRUMENTS AND EQUIPMENT

Language Development Survey (LDS)

The LDS (Rescorla, 1989) is a checklist of 300 of the most common words in children's early vocabularies. It has been reported to show excellent sensitivity,

specificity, reliability and validity in identifying toddlers as delayed in expressive language development. Similar checklists (Dale, Bates, Reznick & Morrisset, 1989; Reznick & Goldsmith, 1989) suggest that the parent checklist format is a valid index of expressive vocabulary size.

Test of Language Development-Primary (TOLD-P)

Of the language data collected when the children reached four years of age, two composite scores from the TOLD-P (Newcomer & Hammill, 1982) were selected as outcome measures for this study. The TOLD-P is a nationally standardized measure of a variety of language subskills, which reports good reliability and validity data in its statistical manual. The Listening Quotient is a composite of the Picture Vocabulary, Grammatical Understanding subtests of the TOLD-P. The Speaking Quotient is a composite of scores achieved on the Oral Vocabulary, Sentence Imitation, and Grammatical Completion subtests. These subtests evaluate phonology, morphology, syntax, and semantics. These composite quotients were selected in order to separate receptive and expressive language abilities.

Mean Length of Utterance (MLU)

Mean length of utterance is a general measure of syntactic maturity. MLU is calculated by averaging the

number of morphemes a child uses per utterance in a 50-utterance speech sample. Since, in early language development, the complexity and length of a child's utterances generally increase simultaneously, MLU provides a reliable index of productive skills in spontaneous conversation. Mean length of utterance was interpreted using the norms established by Miller (1981).

Equipment

Hearing was screened using a Maico clinical audiometer, model 24B, which was calibrated in accordance with American National Standards Institute (1972) specifications. Tympanograms were obtained using a Saico Impedance Bridge, model SI22.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

Reported History of Ear Infections

Eleven of the parents responded to, "How many ear infections has your child had?" with something other than a single number. These responses were interpreted according to the procedures detailed in Chapter III. The average number of ear infections reported for children in the Normal-language and LT groups are shown in Table II. A one-tailed t-test comparing the mean number of ear infections reported for children in the Normal-language and LT groups was computed using an alpha level of .05. The results of the comparison are shown in Table III. The test statistic indicated that no difference exists in the mean number of ear infections reported for the two groups of children.

Comparisons of TOLD-P Scores

Listening Quotient Comparisons. Subgroups were compared in terms of receptive language skills by examining Listening Quotients achieved on the TOLD-P. Within both the Normal-language and the LT groups, the mean Listening

Quotient of the subgroup with a history of otitis media was compared to that of the subgroup with no such history. A one-tailed t -test using an alpha level of .01 was used to make the comparison within the Normal-language group. Results of the comparison are shown in Table IV. The mean score achieved by the group of normal-language children without a history of otitis media was significantly higher than that achieved by the group with a history of otitis media. The difference in the mean scores of subgroups in the LT group was not examined statistically since the mean score of the OM+ group was higher than that of the OM- group. The mean scores for all four subgroups were well within the normal range.

TABLE II
REPORTED HISTORY OF EAR INFECTIONS

Group	N	Mean	s.d.
Normal	25	4.6	4.6
OM+	11	8.8	3.8
OM-	14	1.2	0.8
LT	28	6.7	6.0
OM+	15	10.8	5.5
OM-	13	1.9	1.2

TABLE III

RESULTS OF A ONE-TAILED t -TEST COMPARING THE MEAN
NUMBER OF REPORTED EAR INFECTIONS IN THE
NORMAL LANGUAGE AND LT GROUPS

Group	Mean	t-Test	Critical Value	Significance?
Normal	4.6	1.42	1.68	NO
LT	6.7			
Alpha = .05, d.f. = 51				

TABLE IV

RESULTS OF A ONE-TAILED t -TEST COMPARING THE MEAN
LISTENING QUOTIENTS OF OM POSITIVE AND
OM NEGATIVE SUBGROUPS

Group	Mean	s.d.	t-Test	Critical Value	Significance?
Normal					
OM +	98.91	12.11	2.6	2.5 (alpha=.01, d.f.=23)	YES
OM -	109.29	7.83			
LT					
OM +	99.93	13.95			NO
OM -	98.23	14.36			

The data were examined for the existence of a significant difference between the mean listening quotients of those children who had been assigned to the Normal-language group at age 2 and those who had been assigned to the LT group. The results of a one-tailed t -test are shown in Table V. The results indicate that at a .05 level of significance, the Normal-language and LT groups

did not differ significantly in terms of receptive language abilities at age four.

TABLE V
RESULTS OF A ONE-TAILED t -TEST COMPARING
THE MEAN LISTENING QUOTIENTS
OF NORMAL AND LT GROUPS

Group	Mean	s.d.	t-Test	Critical Value	Significance?
Normal	104.72	11.04	1.60	1.68	NO
LT	99.14	13.90			
Alpha = .05, d.f. = 51					

The group of normals who had a history of ear infections was excluded from the normal group and mean listening quotients were again compared. As shown in Table VI, the mean score of the Normal-language group with no history of ear infections was significantly higher than the mean score of the combined LT group.

TABLE VI
RESULTS OF A ONE-TAILED t -TEST COMPARING THE
MEAN LISTENING QUOTIENTS OF OM- NORMAL
AND LT GROUPS

Group	Mean	s.d.	t-Test	Critical Value	Significance?
Normal OM -	109.29	7.83	2.53	1.68	YES
LT	99.14	13.90			
Alpha = .05, d.f. = 40					

Speaking Quotient Comparisons. Subgroups were compared in terms of expressive language skills by examining Speaking Quotients achieved on the TOLD-P. The mean speaking quotients of the OM+ and OM- subgroups were compared within both the Normal-language and LT groups. In order to minimize the risk of making Type I errors in doing multiple t-tests, and because the mean values within each group were nearly equal, the differences were not examined statistically. It is assumed that the differences are insignificant. Results are shown in Table VII.

TABLE VII

COMPARISON OF THE MEAN SPEAKING QUOTIENTS OF
OM POSITIVE AND OM NEGATIVE SUBGROUPS

<u>Group</u>	<u>Mean</u>	<u>s.d.</u>	<u>Significance?</u>
Normal			
OM +	105.91	11.72	NO
OM -	106.21	9.17	
LT			
OM +	91.40	12.44	NO
OM -	91.15	10.47	

A one-tailed t-test comparing the mean Speaking quotients of the Normal-language and LT groups was performed. The results are reported in Table VIII. Children in the normal group scored significantly higher on the expressive portion of the TOLD-P than children in

the LT group. The mean scores for all four subgroups, however, were within the normal range.

TABLE VIII
RESULTS OF A ONE-TAILED t -TEST COMPARING THE
MEAN SPEAKING QUOTIENTS OF
NORMAL AND LT GROUPS

Group	Mean	s.d.	t-Test	Critical Value	Significance?
Normal	106.08	10.14	4.97	1.68	YES
LT	91.29	11.36			

Alpha = .05, d.f. = 51

Mean Length of Utterance

The mean MLUs of subgroups were compared within the Normal-language and LT groups. In both comparisons mean MLUs of the OM- group was less than mean MLUs of the OM+ group. Therefore, statistical analysis was not performed. Data is displayed in Table IX.

TABLE IX
COMPARISON OF THE MEAN MLU OF OM POSITIVE
AND OM NEGATIVE SUBGROUPS

Group	Mean	s.d.	Significance?
Normal			
OM +	4.79	.77	NO
OM -	4.50	.88	
LT			
OM +	4.01	1.14	NO
OM -	3.81	1.04	

A one-tailed t -test comparing the means of the MLUs of the Normal-language and LT groups was performed. The results are shown in table X. The mean length of utterance used by the Normal-language group was significantly greater than that of the LT group. At 51 months (the average age of the subjects at the time of follow-up evaluations) the predicted MLU range at ± 1 SD is 3.71-5.71 (Miller, 1981). The mean MLU for both the Normal-language and LT groups was within this normal range.

TABLE X
RESULTS OF A ONE-TAILED t -TEST COMPARING
THE MEAN MLU OF NORMAL
AND LT GROUPS

Group	Mean	s.d.	t-Test	Critical Value	Significance?
Normal	4.63	.83	2.66	1.68	YES
LT	3.92	1.08			
Alpha = .05, d.f. = 51					

Post Hoc Comparisons

Since no connection was found between a reported history of otitis media and an increased risk of language delay in late-talking children, the relevance of other factors was tested. Socio-economic status and a family history of language delay were examined to determine whether these two factors were relevant.

Socio-economic Status. A Pearson product-moment correlation was performed on data from the Normal-language group and on data from the LT group in order to determine if there was a relationship between socio-economic status and Listening Quotients. Significance was tested at a .05 level. No correlation was found. Results are displayed in table XI.

TABLE XI
RESULTS OF PEARSON PRODUCT-MOMENT
CORRELATIONS BETWEEN SES AND
LISTENING QUOTIENTS

Group	r	t-Test	Critical Value	d.f.	Significance?
Normal	-.259	-1.286	±2.07	23	NO
LT	-.080	-0.409	±2.06	26	NO

Two tailed, Alpha = .05

The mean socio-economic status of each subgroup was then examined to determine if the difference in SES observed between otitis media subgroups was a significant one. A one-tailed t-test was used at a .05 level of significance. Children in the normal OM+ subgroup were determined to be of significantly lower SES than children in the OM-group. This relationship was not found for the LT group. Results are displayed in Table XII.

TABLE XII
RESULTS OF A TWO-TAILED t -TEST COMPARING
THE MEAN SES OF OM+ AND
OM- SUBGROUPS

Group	Mean	s.d.	t-Test	Critical Value	Significance?
Normal					
OM +	3.09	1.45	2.69	2.07 (d.f.=23)	YES
OM -	1.79	.97			
LT					
OM +	2.93	1.03	.41	2.06 (d.f.=26)	NO
OM -	2.77	1.01			

Alpha = .05; SES based on a scale of 1 to 5 with 1 being the highest and 5 being the lowest.

Family History of Language Delay. The number of children who's parents reported that someone else in the family had been slow to learn to talk was computed. Twelve of the 28 children (43%) in the LT group had a family history of language delay while only two out of 25 children (8%) in the Normal-language group had a family history of language delay. Contingency tables were constructed for Normallanguage and LT groups. The contingency table for the LT group is displayed in table XIII.

This table was analyzed using the Chi-square test. A .05 level of significance was used. The results of the test are displayed in table XIV. Otitis media and a family history of language delay were not statistically dependent for children in the LT group.

TABLE XIII

CONTINGENCY TABLE DISPLAYING THE NUMBER OF SUBJECTS
WITHIN LT GROUP WITH AND WITHOUT A
FAMILY HISTORY OF LANGUAGE DELAY

	LT OM+	LT OM-	Totals
Family History	4	8	12
No Family History	11	5	16
Totals	15	13	28

TABLE XIV

RESULTS OF A CHI-SQUARE TEST ANALYSIS
OF DATA FROM LATE TALKERS GROUP

Group	χ^2	Critical Value	Dependent?
LT	3.46	3.84	NO
Alpha = .05, d.f. = 1			

The distribution of children in the Normal-language group according to their experience with otitis media and their family's history of language delay is displayed in table XV.

TABLE XV

CONTINGENCY TABLE DISPLAYING THE NUMBER OF SUBJECTS
WITHIN NORMAL LANGUAGE GROUP WITH AND WITHOUT
A FAMILY HISTORY OF LANGUAGE DELAY

	Normal OM+	Normal OM-	Totals
Family History	2	0	2
No Family History	9	14	23
Totals	11	14	25

The contingency table for the Normal-language group was analyzed using Fisher's exact test. This test is appropriate when the expected frequency of any cell of a contingency table is too small for the data to be analyzed using the Chi-square test. The exact test was conducted using a .05 level of significance and the results are shown in table XVI. Otitis media and a family history of language delay was not statistically dependent for children in the Normal-language group.

TABLE XVI
RESULTS OF A FISHER EXACT TEST ANALYSIS
OF DATA FROM NORMAL LANGUAGE GROUP

Possible Frequency a	Probability of outcome P(a)	Cumulated probability CumP(a)	Significance? Alpha=.05
* 2	.183	.183	NO
0	.303	.486	
1	.513	1.000	
*observed frequency			

Contingency tables were then constructed using information about the family history of language delay and information about the Listening quotients from the TOLD-P. Each of the four otitis media subgroups was examined individually. The Listening quotient of each child was compared with the mean Listening quotient of that subgroup. The number of subjects who scored no more

than 1 standard deviation below the mean was tallied as was the number of subjects who scored more than one standard deviation below the mean. The contingency table for the Normal-language, OM+ group is displayed in Table XVII.

TABLE XVII

CONTINGENCY TABLE DISPLAYING NUMBER OF SUBJECTS WITHIN
NORMAL OM+ GROUP ACCORDING TO FAMILY HISTORY
OF LANGUAGE DELAY AND LISTENING QUOTIENT

	Listening Quotient Below 1 s.d.	Within 1 s.d.	Totals
Family History	1	1	2
No Family History	1	8	9
Totals	2	9	11

The contingency table for the Normal-language OM+ group was analyzed using Fisher's Exact Test at a .05 level of significance. The results are displayed in Table XVIII and indicate that a family history of language delay and obtaining a Listening Quotient more than one standard deviation below the group mean were not statistically dependent for the Normal-language OM+ subgroup.

A contingency table for the Normal-language OM- subgroup was constructed. None of the parents of children in this subgroup reported a family history of language delay. This information is shown in table XIX.

TABLE XVIII
RESULTS OF A FISHER EXACT TEST ANALYSIS
OF DATA FROM NORMAL OM+ GROUP

Possible Frequency a	Probability of outcome P(a)	Cumulated probability CumP(a)	Significance? Alpha=.05
2	.018	.018	NO
* 1	.327	.345	
0	.654	1.000	

*observed frequency

TABLE XIX
CONTINGENCY TABLE DISPLAYING NUMBER OF SUBJECTS WITHIN
NORMAL OM- GROUP ACCORDING TO FAMILY HISTORY
OF LANGUAGE DELAY AND LISTENING QUOTIENT

	Listening Quotient		Totals
	Below 1 s.d.	Within 1 s.d.	
Family History	0	0	0
No Family History	1	13	14
Totals	1	13	14

The results of a Fisher Exact Test for this contingency table indicated that a family history of language delay and the receptive language outcome score was not statistically dependent for children in the Normal-language group who had no history of otitis media. The result is shown in Table XIX.

TABLE XX
RESULTS OF A FISHER EXACT TEST ANALYSIS
OF DATA FROM NORMAL OM- GROUP

Possible Frequency a	Probability of outcome P(a)	Cumulated probability CumP(a)	Significance? Alpha=.05
* 0	1.00	1.00	NO

*observed frequency

Contingency tables were then constructed for subjects in the LT group. Table XXI shows the distribution of children from the LT group who had a reported history of otitis media. Subjects were entered in the table depending upon their family's experience with language delay and their Listening Quotient on the TOLD-P.

TABLE XXI
CONTINGENCY TABLE DISPLAYING NUMBER OF SUBJECTS WITHIN
LT OM+ GROUP ACCORDING TO FAMILY HISTORY OF
LANGUAGE DELAY AND LISTENING QUOTIENT

	Listening Quotient		Totals
	Below 1 s.d.	Within 1 s.d.	
Family History	1	3	4
No Family History	2	9	11
Totals	3	12	15

The contingency table of the LT OM+ subgroup was analyzed using a Fisher Exact Test at a .05 level of

significance (Table XXII). As was the case with the previous subgroups tested, a family history of language delay and a comparatively low Listening Quotient were not statistically dependent for subjects in the LT group who had a reported history of otitis media.

TABLE XXII
RESULTS OF A FISHER EXACT TEST ANALYSIS
OF DATA FROM LT OM+ GROUP

Possible Frequency a	Probability of outcome P(a)	Cumulated probability CumP(a)	Significance? Alpha=.05
3	.009	.009	
2	.145	.154	
0	.363	.517	
* 1	.483	1.000	NO

*observed frequency

A final contingency table was constructed of subjects in the LT group who had no reported history of otitis media. This data is displayed in Table XXIII. The distribution of children in the LT OM- subgroup was analyzed using the Fisher Exact Test (Table XXIV). As was the case with each of the other subgroups, a family history of language disorders and scoring more than one standard deviation below the group mean Listening Quotient were not statistically dependent for this group.

TABLE XXIII

CONTINGENCY TABLE DISPLAYING NUMBER OF SUBJECTS WITHIN
LT OM- GROUP ACCORDING TO FAMILY HISTORY OF
LANGUAGE DELAY AND LISTENING QUOTIENT

	Listening Quotient		Totals
	Below 1 s.d.	Within 1 s.d.	
Family History	2	6	8
No Family History	0	5	5
Totals	2	11	13

TABLE XXIV

RESULTS OF A FISHER EXACT TEST ANALYSIS
OF DATA FROM LT OM- GROUP

Possible Frequency a	Probability of outcome P(a)	Cumulated probability CumP(a)	Significance? Alpha=.05
0	.128	.128	
* 2	.359	.487	NO
1	.513	1.000	
* 1	.483	1.000	NO

*observed frequency

Summary of Results

To summarize the results of this study:

1. There was no significant difference in the mean number of reported "ear infections" of children in the LT group compared to those in the Normal-language group.
2. Within the group of Late-talkers there were no significant differences in Listening Quotients, Speaking Quotients, or MLU between OM+ and OM-subgroups.

3. Within the group of Normal-language children there was no difference in Speaking Quotients or MLU between OM+ and OM- subgroups. There was, however, a significant difference in the Listening Quotients of these subgroups.
4. Subjects in the Normal-language OM+ group were from families of significantly lower SES than subjects from the OM- group. No correlation was found between SES and Listening Quotients.
5. No correlation was found between a reported family history of language delay and either a reported of otitis media or comparatively lower Listening Quotients.

DISCUSSION

Reported History of Ear Infections

The first research question addressed the possibility that delayed language acquisition could be associated with a greater number infections during the first two years of life. The mean number of ear infections reported by the parents of the Normal-language and the LT subjects was compared. While the LT subjects were reported to have more ear infections ($x=6.7$) than the Normal-language group ($x=4.6$), the comparison did not reach a significant level, indicating that the number of ear infections alone could not account for the delayed language acquisition of children in the LT group. These results are consistent with those of Bishop and Edmundson (1986) who found no significant difference in the number of reported ear infections in language-disordered and control children.

The majority of parents of children in both diagnostic groups reported that their children had experienced at least one ear infection (Normal=88%, LT=93%). In addition, approximately one third of the children in each group had abnormal tympanograms (Normals=32%, LT=36%) suggesting the possibility of otitis media. These results are consistent with the large body of research indicating that otitis media is a very common disease among young children.

Language Outcome Measures

The second research question looked at language outcomes of children who were identified as Late-talkers. This study failed to identify a relationship between a reported history of ear infections and language outcome measures for this group.

The third research question addressed children in the Normal-language group. While no relationship was found between a reported history of ear infections and expressive language outcomes (Listening Quotients and MLU) a relationship was found between a reported history of ear infections and receptive language outcome measures.

These results necessitate a discussion of two issues:

1) Why was there a significant effect in the Normal-language group and not in the the LT group?; and 2) Why was there a significant difference within the Normal-language group in receptive language scores but not in

expressive language scores? Each of these questions will be discussed.

Significant Difference in Normals Versus
No Significant Difference in LTs

Raw data was re-examined in order to find a basis for a significant difference in Normals and not in LTs. The fourth research question was investigated. It was discovered that the children in the Normal-language group who had a reported history of ear infections also were of lower SES than those in the normal language group who had no reported history of ear infections. This difference in socio-economic status did not occur in the LT group. Dividing the Normal-language group into sub-groups according to reported experiences with ear infections had also divided it according to SES. Leviton and Bellinger (1986) warns of socio-economic status as a possible confounder in any study of otitis media since SES is associated with risk of otitis media as well as with later language skills.

The distribution of children into OM+ and OM- groups according to higher and lower SES is consistent with research which has shown that children from lower socio-economic families tend to experience more episodes of otitis media than children from higher socio-economic families (Feagans, Blood, & Tubman, 1988).

A Pearson product moment correlation was performed using data from the Normal-language group in order to determine whether there was a relationship between SES and Listening Quotients. The test did not reach significance, indicating that SES by itself could not explain the the difference in Listening Quotients in this group. This suggests that for children in the Normal-language group, a low socio-economic status coupled with a history of otitis media might interact to place a child at risk of comparably slower language development than those who were from a middle class socio-economic environment and who had little experience with otitis media.

A difference in the overall rate of language growth between the Normal and LT groups may have contributed to the significant difference in normals versus no significant difference in LTs. Children in the Normal-language group were developing language normally at the time of intake and could be expected to continue a rapid growth in language. Those in the LT group were slow to acquire language and might continue to experience a slow rate of language development. If the rate of language development of a child was slowed while that of his peers surged ahead, a large discrepancy might develop. However, if the rest of the group was developing language at a relatively slow pace, only a small discrepancy might occur. Factors such

as otitis media which interfered with the rapid language growth of members of the Normal-language group could lead to larger, significant differences. Factors which interfered with the relatively slow language growth of children in the LT group would lead to smaller, insignificant differences.

The significant difference in expressive language outcome measures between the Normal-language and LT groups was not surprising since the diagnostic groups were formed on the basis of expressive language performance. It was reasonable to expect that the LT group might continue to show significantly lower scores when tested at age four. These results support the idea that children who are late talkers may be at risk of continued language delay. It should be noted that while the mean for the LT group was within the normal range, a substantial proportion (25%) of LT subjects scored more than 1 s.d. below the mean for the test.

Significant Difference in Receptive Versus Expressive Language

Since language production is dependent upon language comprehension, one would expect a reduced or distorted auditory signal to impact either expressive language or both receptive and expressive language. While it is unclear why within the Normal-language group, the OM+ and OM-

demonstrated a significant difference in receptive language alone, the results are not without precedent. Among otitis media studies which have reported differences in verbal comprehension but not in verbal expression are Silva, Kirkland, Simpson, Stewart and Williams (1982) and Menyuk (1986). Reichman and Healey (1983) suggest test artifact as a possible factor in such outcomes.

In the present study, the small number of subjects used may have been indirectly responsible for this outcome. When subgroups are small the results are more apt to reflect the performance of a single child rather than the general performance of the group. The listening quotient of one subject in the Normal-language OM+ group, for example, was 27 points below the same subject's speaking quotient. One might question whether this child's Listening quotient was an accurate indication of his/her language comprehension and, if not, whether this would have an impact upon the results of the study. A larger number of subjects would decrease the risk that an unreliable test result would affect the outcome of the study.

Another possible explanation for the difference in receptive rather than in expressive language may be in the nature of the required test response. It has been suggested that chronic otitis media may negatively affect a child's attention skills (Feagan et al., 1988). A child

who characteristically demonstrates poor attending behavior might be more likely to do so on the receptive subtests of the TOLD-P than on the expressive subtests. The receptive subtests require the child to point to a picture. The child can provide some reponse, correct or incorrect, with only a minumum amount of attention to the task. The expressive portion, on the other hand, requires the child to use better attending skills in order to provide any response at all.

Family History of Language Delay

The final research question concerned the effects of a family history of language delay. This study found that a family history of language delay and a history of OM were not statistically dependent for children in either the Normal-language group or the LT group. Furthermore, within each OM group, a history of language delay and a Listening Quotient of more than one standard deviation below the group mean quotient were not statistically dependent. There were, however, many more reports of a family history of language delay by parents of children in the LT group than by parents of children in the Normal-language group (LT = 43%, Normal = 8%). These results are consistent with those of Bishop and Edmundson (1986). The authors of that study caution that parents of children who are not believed to be developing language normally

are likely to be searching for reasons. They may be more likely to remember and report relevant details than are parents of children who seem to be developing speech and language normally. While this could contribute to the magnitude of the difference it most likely does not account for the sizable difference observed in this study.

Statistical Versus Clinical Significance

While this study found statistically significant differences between group means, it did not find clinically significant differences. Composite Quotients from the TOLD-P are constructed with a mean score of 100 and a standard deviation of 15. The authors of the TOLD-P suggest that a serious (clinical) language disorder may be signaled by scores of more than two standard deviations below the mean (Newcomer & Hammill, 1988). All group means in the present study were well within the normal range. Of the entire study population of 53 children, only one child received a composite quotient of less than 70. The distinction between statistical as opposed to clinical differences is an important consideration in interpreting the results of this study. All of the differences noted in mean language outcome scores in this study which are reported as statistically significant are, at the same time, relatively small. All group means are within normal limits. The results are indicative of factors associated

with relatively slower language development rather than
with serious language disorder.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

While there is agreement in the literature that otitis media is an extremely prevalent disorder among young children, there is disagreement as to the effect that otitis media has on language development. The lack of definitive research attests to the complexity of the issue and to the need for continued research.

This study examined the relationship between an early history of otitis media and the language development of a group of "late talkers". The 28 toddlers in this group, while otherwise normal, were late to begin to speak. Each of the subjects was placed into one of two subgroups, depending upon their reported experience with otitis media. When the children were four years old, they were evaluated using the TOLD-P and a spontaneous speech sample. A similar group of 25 children who had a history of normal language development was also examined.

This study found that a reported history of otitis media did not constitute any additional risk of language disorder to the group of late-talking children. There

were no differences in language outcome scores for OM subgroups within this group. However for subjects in the normal-language group, a negative history of ear infections was associated with significantly better receptive language scores. A significant difference between the socio-economic levels of children in the otitis media subgroups was found to have contributed to this result.

The study found no difference between the frequency of ear infections as reported by the parents of children in the normal and LT groups. However, children in the LT group had a greater family history of language delay than did children in the normal group. The study found no connection between a family history of language delay and a greater number of reported ear infections.

IMPLICATIONS

Clinical Implications

The results of this study indicate that children who demonstrate expressive language delays at age two risk continued language delays, at least until age four. A history of otitis media, however, does not appear to add to this risk. These results suggest the need to continue to monitor the language development of Late-talkers regardless of their experience with otitis media. It implies that Late-talkers, in general, may benefit from

early language enrichment programs.

For those children who are developing language normally at age two, an early history of otitis media may interact with factors such as low socio-economic status to constrain slightly their receptive language growth. These children, too, may benefit from early language stimulation even though their language skills are within the range of normal development.

Parents should be counseled that fear of adverse language development does not seem to be justified on the basis of otitis media alone. They should be told that risk factors such as a family history of language disorder, low socio-economic status, and late talking may be more detrimental to language development than a history of ear infections. They should also be informed that research into the effects of otitis media is inconclusive and our understanding is inadequate.

Research Implications

It has been suggested by Feagans, Blood, Tubman (1988) that questions concerning the effects of otitis media will continue to elude answers because, "we are studying human beings who cannot always be randomly assigned and/or manipulated medically to satisfy our thirst for truth" (pg. 347). Numerous additional studies will be needed in order to provide a better understanding of this very

common disease.

The design and interpretation of studies into the effects of otitis media are complicated by many secondary factors associated with otitis media. Further research is needed in order to clearly identify precisely what these factors are.

The risk of language delay may vary according to the group being studied. Continued research using children from a variety of populations is needed. While otitis media may not, in itself, place a child at risk of language delay, it may interact with other variables to place a child at risk. More research is needed in order to test this hypothesis and to determine what those variables might be.

The present study raises several questions which could be explored in follow-up studies. Among these questions are:

1. How accurate are parent reports of ear infections?
2. How do attention deficits differentially affect receptive and expressive performance on standardized language tests?
3. For the children in this study, how do reports of additional ear infections during the third and fourth years of life compare to those reported for the first two years?
4. Does the inclusion of this additional data lead to significant differences in language outcomes?

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APPENDIX A

INITIAL PARENT QUESTIONNAIRE

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 OK if the words aren't entirely clear, as long as you can understand them.)

none _____ 10-30 _____

less than five _____ 30-50 _____

5-10 _____

If your child says fewer than ten 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 B

INFORMED CONSENT 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.

APPENDIX C

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 birthdate are needed for identification purposes.

Today's date _____	Child's birthdate _____
Child's first name _____	Child's sex _____
Mother's address: _____	Father's address: _____
Mother's telephone _____	Father's telephone _____
Mother's date of birth: _____	Father's date of birth: _____
Mother's marital status: _____	Father's marital status: _____
Mother's level of education: _____	Father's level of education: _____
Mother's employment: _____	Father's employment: _____
not employed _____	not employed _____
employed part-time _____	employed part-time _____
employed full-time _____	employed full-time _____
occupation (past or present): _____	occupation (past or present): _____
gross income per year: _____	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 day care 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 D

LANGUAGE DEVELOPMENT SURVEY

Language Development Survey

The Language Development Survey is designed to measure vocabulary development and early word combinations in young children by the use of parent report. By carefully completing the Language Development Survey, you can help us obtain an accurate picture of your child's developing language skills. Please check off each word your child says. Don't include words your child understands but does 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.

Thank you for helping us learn more about your child's language development.

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
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
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96	96
97	97
98	98
99	99
100	100

Employment:	Employment:
-------------	-------------

Not employed _____

Employed part-time _____ Employed part-time _____

Employed full-time

Occupation _____ Occupation _____

Please give age and sex of other children in your 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 your child in day care or cared for regularly by a 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 REVERSE SIDE

Language Development Survey

Please check off each word that your child says SPONTANEOUSLY (not just imitates or understands).
It's okay to count words that aren't pronounced clearly or are in "baby talk" ("baba" for bottle.).

FOODS	ANIMALS	ACTIONS	HOUSE- HOLD	PERSONAL	CLOTHES	MODIFIERS	OTHER
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	excuse me
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	dinner	fork	tissue	pants	dirty	my
drink	fish	doodoo	glass	toothbrush	shirt	dry	myself
egg	frog	down	knife	umbrella	shoes	good	nightnight
food	horse	eat	light	watch	slippers	happy	no
grapes	monkey	feed	mirror	PEOPLE	sneakers	heavy	off
gum	pig	finish	pillow	aunt	socks	hot	on
hamburger	puppy	fix	plate	baby	sweater	hungry	out
hotdog	snake	get	potty	boy	VEHICLES	little	please
icecream	tiger	give	radio	daddy	bike	mine	Sesame St.
juice	turtle	go	room	doctor	boat	more	shut up
meat	BODY	have	sink	girl	bus	nice	thank you
milk	PARTS	help	soap	grandma	car	pretty	there
orange	arm	hit	spoon	grandpa	motorcycle	red	under
pizza	bellybutton	hug	stairs	lady	plane	stinky	welcome
pretzel	bottom	jump	table	man	stroller	that	what
raisins	chin	kick	telephone	mommy	train	this	where
soda	ear	kiss	towel	own name	trolley	tired	why
soup	elbow	knock	trash	pet name	truck	wet	woofwoof
spaghetti	eye	look	T.V.	uncle		white	yes
tea	face	love	window	Ernie, etc.		yellow	you
toast	finger	lunch				yucky	yummy
water	foot	make					1, 2, 3, etc.
TOYS	hair	nap					
ball	hand	open					
balloon	knee	outside					
blocks	leg	pattycake					
book	mouth	peekaboo					
crayons	neck	peepee					
doll	nose	push					
picture	teeth	read					
present	thumb	ride					
slide	toe	run					
swing	tummy	see					
teddybear		show					
OUTDOORS	PLACES	shut					
flower	church	sing					
house	home	sit					
moon	hospital	sleep					
rain	library	stop					
sidewalk	park	take					
sky	school	throw					
snow	store	tickle					
star	zoo	up					
street		walk					
sun		want					
tree		wash					

Please list any other words your child uses here:

Does your child combine two or more words into phrases?
(e.g. "more cookie," "car byebye," etc.) yes _____ no _____

Please write down **three** of your child's longest and best sentences or phrases.

1. _____

2. _____

3. _____