The Prevalence of Developmental Apraxia in School-aged Children of Illinois

Mary Jo Seibert

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Date Author
The Prevalence of Developmental Apraxia in
School-aged Children of Illinois

(TITLE)

BY

Mary Jo Seibert

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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CHARLESTON, ILLINOIS

1994

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

3/29/94
DATE

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ABSTRACT

Current research involving developmental apraxia of speech has focused on two areas: 1) determining a unique set of speech and language characteristics of the disorder; and 2) determining an etiology or cause of developmental apraxia. Failure of researchers to determine these issues has lead to increased controversy over the existence of developmental apraxia. Further, no studies have been conducted which discuss the prevalence of developmental apraxia. This researcher suggests that determining the prevalence of developmental apraxia would assist in establishing the disorders' existence, as well as aid researchers in determining if speech-language pathologists have adequate training and knowledge in the diagnosis and treatment of the disorder.

Therefore, a survey was designed to obtain information in the prevalence of developmental apraxia; the major identifying characteristics of the disorder; and the subjects' academic training in the diagnosis and treatment of the disorder. One hundred and sixteen school speech-language pathologists in Illinois served as subjects and supplied survey information.

The results indicated that speech-language pathologists were diagnosing and treating the disorder within the population sampled. In addition, the children reported with developmental apraxia displayed many of the same speech and language characteristics as reported by researchers in the literature.

Speech-language pathologists from across Illinois reported feeling inadequately prepared to diagnose and treat developmental apraxia. More specifically, the subjects felt the least adequate in diagnosis of the disorder. In addition, the results indicated that speech-language pathologists believe more classes were needed in the diagnosis and treatment of developmental apraxia.

Differences among the regions across Illinois were examined and implications of the study were discussed.
ACKNOWLEDGEMENTS

I extend my sincere appreciation to Dr. Nilsen, my thesis advisor, who has guided and directed my thinking throughout my research and writing. Your knowledge and insight in the field of communication disorders, as well as your stamina for life, have inspired me.

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My thanks also goes out to the 116 speech-language pathologists working in the public schools of Illinois who took the time out of their busy schedules to complete the survey. Without their help, the study could not have taken place.

To the rest of the faculty and students at the Speech-Language-Hearing Clinic, your support and encouragement kept me motivated throughout the experience. Thank you.
DEDICATION

I would like to dedicate the completion of this project to my fiancee, Rick Whobrey, who has helped to motivate and support me during this research project. He has taught me that any goals are easily accomplished with integrity and determination. His understanding and love have guided me and helped me attain the self confidence needed to complete this project.
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CHAPTER I

INTRODUCTION

Among the neurogenic disorders of communication in children is the motor speech disorder, developmental apraxia of speech. Developmental apraxia of speech is characterized by the impairment of the ability to program the positions of the musculature used for speaking and to sequence the movements for producing phonemes (Jaffe, 1986). The concept of developmental apraxia is surrounded by controversy and some researchers feel that there is insufficient evidence to justify the diagnosis of apraxia of speech of a developmental nature (Jaffe, 1986).

Research in developmental apraxia of speech has therefore focused on justifying its existence. For example, Yoss & Darley, 1974, Williams, et. al, 1981, Pearson, 1984, Crary, 1986, and Love, 1992, conducted research studies to pinpoint unique symptoms attributed to developmental apraxia. Unfortunately, disagreement exists among these studies. Researchers have been unsuccessful in determining a unique set of speech and language characteristics for developmental apraxia of speech.

Research has also focused on pinpointing an etiology or cause of developmental apraxia of speech. Many researchers, such as Marquadt & Sussman, 1991, Love, 1992, Rosenbek & Wertz, 1972, Yoss & Darley, 1974 and Horwitz, 1984, attempted to find a cause of the disorder. Unfortunately, all of the studies conducted failed to demonstrate consistent neurological findings among the children diagnosed with developmental apraxia. Therefore, an etiology or site of lesion in the brain could not be determined to account for the disorder.

Due to the inability of researchers to find a unique set of speech and language characteristics and an etiology for developmental apraxia, the existence of the disorder continues to be unsubstantiated. Further, no research studies have been conducted to determine a prevalence or incidence of the disorder within the child population.
The purpose of the present investigation was to determine the prevalence of developmental apraxia of speech in public school aged children of Illinois and major identifying characteristics of the disorder. In addition, information was obtained regarding the subjects' feeling of preparedness in the diagnosis and treatment of developmental apraxia. The data obtained by this investigation assisted in revealing the disorder's existence, as well as determining if speech-language pathologists were adequately trained in the diagnosis and treatment of developmental apraxia.
CHAPTER II

LITERATURE REVIEW

DEVELOPMENTAL APRAXIA

Definition. Developmental apraxia of speech has been defined as a childhood disorder characterized by the inability to program and coordinate the movements necessary to produce intelligible speech (Yoss & Darley, 1974; Eisenson, 1972; Jaffe, 1988; Hall, 1989; Marquadt & Sussman, 1991). This inability to carry out movements of the speech apparatus occurs in the absence of impaired neuromuscular function (Marquadt & Sussman, 1991; Weiss, Gordon, Lillywhite, 1987). Purposeful or voluntary speech actions generally produce difficulty for these children, whereas involuntary or automatic speech is unimpaired (Creaghead, Newman, & Secord, 1989; Bernthal & Bankson, 1988; Robin, 1992).

Early History. Signs of developmental apraxia are evident early in speech and language development. Normal responses to sounds of the environment are displayed during infancy. However, verbal imitation is not produced during typical baby games, such as "patty cake" or "itsy, bitsy spider" and little vocal play and noninformative crying are present during the early stages of development (Eisenson, 1972; Jaffe, 1986). Feeding problems such as frequent regurgitations, especially on bulk food, are also early signs of developmental apraxia (Eisenson, 1972). In addition, handedness preference is not displayed until the age of five. It is also likely that developmental apraxia is familial (Eisenson, 1972; Hall, 1989; Jaffe, 1986; Bernthal & Bankson, 1988).

Speech/Language Characteristics. The disordered speech becomes more evident in the latter stages of development. A reduced repertoire of sounds is highly characteristic of developmental apraxia (Chappell, 1972; Jaffe, 1986). Articulation errors are highly inconsistent; however, errors frequently occur as omissions, distortions, additions, repetitions, and prolongations (Chappell, 1973; Jaffe, 1986; Weis, Gordon & Lillywhite,
1987; Marquadt & Sussman, 1991; Love, 1992). In addition, difficulty is experienced when producing fricatives, affricates, and consonant clusters. Articulation errors are usually described as two and three feature errors, such as errors in place, manner or voicing; and errors increase as the length of utterance increases (Yoss & Darley, 1974; Hall, 1989; Jaffe, 1986; Creaghead, Newman & Secord, 1989). Numerous vowel errors are also evident in apraxic speech (Jaffe, 1986; Marquadt & Sussman, 1991; Love, 1992).

Struggling behavior (i.e., facial grimaces, etc.) are evident during speech. Besides having poor imitative skills, a noticeable groping behavior is observed before and during purposeful speech (Chappell, 1973; Hall, 1989; Jaffe, 1986; Bernthal & Bankson, 1988; Creaghead, Newman & Secord, 1989; Weiss, Gordon, & Lillywhite, 1987). Due to these groping behaviors, in combination with faulty articulation, slower than normal diadochokinetic rates are produced (Yoss & Darley, 1974; Jaffe, 1986; Marquadt & Sussman, 1991; Love, 1992).

Prosody may also be affected. Problems with slow rate and equalization of syllabic and word stress are characteristic of developmental apraxia (Yoss & Darley, 1974; Jaffe, 1986; Weiss, Gordon, & Lillywhite, 1987). In addition, apractic speech displays poor maintenance of syllabic sequences and shapes; and polysyllabic words are altered by additions, omissions, or revisions of syllables (Yoss & Darley, 1974; Jaffe, 1986; Creaghead, Newman & Secord, 1989).

Language comprehension may or may not be impaired. Generally, receptive language abilities are age-appropriate, whereas, expressive language abilities are delayed (Chappell, 1973; Hall, 1989; Jaffe, 1986; Bernthal & Bankson, 1988; Creaghead, Newman & Secord, 1991; Love, 1992). Language deficits can best be characterized by problems with syntax. For example, tense markers are generally omitted in speech. These syntactic deficits are thought to be the result of the breakdown in the selection and sequencing of the motor programmers (Creaghead, Newman & Secord, 1989).
Voicing errors will also be present in developmental apraxia. Twice as many voiced to voiceless feature errors will be experienced in developmental apraxia vs. an articulation disorder (Yoss & Darley, 1974; Jaffe, 1986). Some researchers have also found inconsistent nasal qualities, such as nasal emissions or oral-nasal resonance confusions (Jaffe, 1986; Hall, 1989).

Associated Apraxias. Coexisting with the apraxic speech, an accompanying oral apraxia may be observed (Chappell, 1973; Jaffe, 1986; Bernthal & Bankson, 1988; Creaghead, Newman, & Secord, 1989; Weiss, Gordon, & Lillywhite, 1987; Love, 1992). For example, difficulty is experienced forming lip, tongue and jaw patterns. Blowing or puckering the lips on command is difficult (Bernthal & Bankson, 1988; Yoss & Darley, 1974; Chappell, 1974). Gerald Chappell (1974) observed ideational or ideokinetic apraxia accompanying oral apraxia resulting in difficulty formulating ideas to carry out certain steps to complete a task.

Neurological Characteristics. Soft neurological signs are observed in developmental apraxia. These signs include difficulty in fine, as well as, gross motor coordination and gait (Yoss & Darley, 1974; Jaffe, 1986; Bernthal & Bankson, 1988; Creaghead, Newman, & Secord, 1989). Alternate motion rates of the tongue and extremeties are relatively slow (Yoss & Darley, 1974).

RESEARCH FINDINGS

Speech/Language Characteristics. Many studies were conducted in an attempt to find symptoms unique to the disorder. Yoss and Darley (1974) used group research designs to see if speech and language characteristics of developmental apraxia were different in any way from speech and language characteristics of phonological disorders. Their results indicated that certain symptoms differentiated these two groups. For example, developmental apraxia of speech displayed more phonemic distortions,
prolongations, repetitions, additions, and two and three feature errors than phonological disorders (Yoss & Darly, 1974).

Williams, et. al., (1981) challenged Yoss and Darley. They used Austrailian children and analyzed 11 speech variables for both repeated speech tasks and spontaneous speech tasks. The speech variables consisted of phonological characteristics such as vowel errors, omission errors, prolongation errors, addition errors, etc. The results indicated that only 2 of the 11 speech variables analyzed differentiated a phonological disorder from a developmental apraxia disorder (Williams, et. al., 1981). These two characteristics were omission of errors on repeated speech tasks and omission of errors on spontaneous speech tasks (Williams, et. al., 1981).

Love (1992) described a study conducted by Pearson in 1984 which confirmed William's study. In his study, Pearson found only two differences between the groups. These differences included backing and insertions of sounds (Love, 1992). It should be noted, however, that these two characteristics were not the same two characteristics that Williams, et. al. (1981) identified.

Crary (1984) also tried to find speech/language characteristics unique to developmental apraxia. He found that disordered syntax was the most salient feature of developmental apraxia (Crary, 1984). These syntactic disorders included deletion of initial and final consonants and omissions of phonemes in all syllable positions (Crary, 1984).

**Etiology.** Many researchers have attempted to explain the etiology or cause of developmental apraxia. For example, Marquadt and Sussman (1991) discussed two nervous system deficits that may underlie the disorder. First, there may have been diffuse or focal brain damage arising from birth trauma or nervous system pathology incurred early in life. Secondly, a disturbance may have occurred in normal neurological maturation specific to cortical areas responsible for speech and language functions (Marquadt & Sussman, 1991).
Love (1992), on the other hand, strongly stated that the etiology is unknown. He cited no convincing evidence of localized or lateralized brain lesions similar to those found in an adult (Love, 1992). Therefore, he concluded that the etiology for adult apraxia is not the same as the etiology for developmental apraxia. Love did state, however, that there tended to be some hereditary factors inherit within developmental apraxia, such as a history of speech and language disorders in the family (Love, 1992).

Earlier studies were conducted to pinpoint exactly where and if a brain lesion could be detected in the presence of developmental apraxia. Rosenbek and Wertz (1972) studied fifty children diagnosed with developmental apraxia. A pediatric neurological examination was completed on 36 of the 50 children. Twenty-two of the 36 children had normal neurological exams with the exception of the apraxia of speech. The remaining 14 demonstrated apraxia of speech with associated neurologic deficits including muscle weakness, hyperreflexia, spasticity, and hyperkinesis (Rosenbek & Wertz, 1972). Electroencephalographic data was available for 26 of the 50 children. Those results indicated that 15 of the 26 children had abnormal EEG's with cases of focal and generalized disturbances of the left and/or right hemisphere (Rosenbek & Wertz, 1972). In summary, the study found 42% of the children studied had normal EEG's and 61% had normal neurological exams even in the presence of the developmental apraxia. Rosenbek and Wertz concluded that these results failed to show definite localization to the left hemisphere, frontal lobe (Rosenbek & Wertz, 1972).

A study conducted by Yoss & Darley (1974) involved 16 children diagnosed as having developmental apraxia of speech. Fifteen out of the 16 children showed abnormal neurological findings in terms of soft neurological signs (Yoss & Darley, 1974). Hard signs, i.e. abnormal EEG's or CT scans, etc., were not seen. These results helped Yoss & Darley to conclude that the etiology could be related to a developmental immaturity of the nervous system (Yoss & Darley, 1974).
The most recent study conducted to determine the exact etiology of developmental apraxia of speech was conducted by Horwitz (1984). Horwitz studied 10 children between the ages of 3 and 12. Eight out of the 10 children exhibited abnormal results on neurological exams with four being restricted to ocular function (Horwitz, 1984). The EEG's conducted were normal for 9 of the 10 cases. The CT scans showed no gross anatomical basis for the disorder (Horwitz, 1984). Horwitz concluded that his study failed to demonstrate consistent neurological findings.

PREVALENCE OF DEVELOPMENTAL APRAXIA

To this date, no studies have been conducted to determine the exact prevalence of this disorder. The only prevalence studies found which discuss communication disorders are issued through the American-Speech-Language-Hearing-Association (ASHA). For example, in 1992, ASHA conducted an omnibus survey which reported the incidence of various communication disorders in typical caseloads across the country. The most frequent communication disorders reported by the speech-language pathologists were childhood language disorders (43.7%) and articulation disorders (32.1%) (Slater, 1992). Other communication disorders reported were fluency (4.3%), voice (4.1%) and disorders resulting from traumatic brain injuries (6.4%) (Slater, 1992). Developmental apraxia was not listed.

Although developmental apraxia was not listed in the survey, it is believed that this disorder is being diagnosed by speech-language pathologists. This is evident as numerous studies have been conducted on children diagnosed with developmental apraxia by speech-language pathologists (Yoss & Darley, 1974; Rosenbek & Wertz, 1972; Williams et. al., 1981; Horwitz, 1984). A possible explanation for developmental apraxia not being listed on the survey is that its major characteristic is faulty articulation and, therefore, many speech-language pathologists may have counted children with developmental apraxia under the category of "articulation disorders". It follows that developmental apraxia is
difficult for clinicians to differentially diagnose due to the absence of a unique set of characteristics describing the disorder. Therefore, clinicians may diagnose the children as having a severe phonological disorder. Such a misdiagnosis may result in the delivery of inappropriate remedial services.

There is a need for research to determine the prevalence of developmental apraxia in children. Researchers are aware of its existence but are unsure of the exact prevalence. Therefore, determining the prevalence of developmental apraxia would be beneficial for the profession. Such data could help establish the disorder's existence, as well as aid researchers to determine if speech-language pathologists have adequate training regarding how to effectively identify and treat children with developmental apraxia of speech. The present study is designed to address these issues and the following questions are asked:

1). What is the prevalence of developmental apraxia in public schools of the state of Illinois?

2). What are the unique identifying characteristics observed in children who have been diagnosed with developmental apraxia?

3). Are school speech-language pathologists adequately prepared to diagnose and treat children with developmental apraxia?
CHAPTER III
METHODS

Survey Design

The survey was designed to obtain information in three major areas: 1) prevalence and speech characteristics of developmental apraxia in school-aged children in the public schools of Illinois; 2) subjects' academic training in the diagnosis/treatment of the disorder; and 3) demographic information about the subjects. In Section I, questions were designed to gather data concerning the prevalence of developmental apraxia. In addition, the speech-language pathologists were asked to choose those characteristics they had observed in children with developmental apraxia. They were asked to identify effective tools of assessment and remediation. This information provided the investigator with an estimated prevalence of the disorder within the sample population included in the survey. In addition, characteristics similar among all children with developmental apraxia were identified. Also, effective tools for assessment and remediation were identified to assist speech-language pathologists in assessing and treating this disorder.

In Section II, the subjects were asked to respond to statements regarding their academic training in developmental apraxia. They were also asked to respond to statements regarding their perceptions of preparedness in treating children with developmental apraxia.

In Section III of the survey, questions were asked regarding the demographics of the subjects. For example, subjects identified their level of education and years in practice. This information was used to make correlations between speech-language pathologists' level of education and their confidence levels in working with children who had developmental apraxia.

All of the questions in each section, except those requiring an answer in narrative form, were designed to produce forced choices. In the literature, forced choice questions were most frequently used to collect survey data. Researchers have found that this type of
question essentially eliminates confusion (Orlich, 1978). In addition, responses are easily tabulated by employing a coding system that assigns each response a number (Orlich, 1978). This coding system was utilized for this study. The nominal data reported was analyzed by a simple count of the number of respondents who marked category 1, category 2, etc.

An initial draft of the survey was reviewed by four speech-language pathologists who were familiar with survey research methods. Using their input, questions were edited or revised to ensure the questions were easy to interpret and were unbiased. The basic format was altered to make it easier for the subjects to complete. The revised survey allowed subjects to complete up to five different individual profiles of children they had seen with developmental apraxia. In addition, the revised format allowed the investigator to conduct an in depth analysis of the individual characteristics of developmental apraxia.(Appendix A)

After the revisions were made, the survey was given to a speech-language pathologist who works in an area elementary school. The speech-language pathologist was not an actual participant in the study. Obtaining this input was important as the survey was only sent to school speech-language pathologists. The revisions provided advice on how the actual length of the survey may influence whether the subject will complete it.

Subject Selection

Subjects were identified from a list of speech-language pathologists in Illinois who work in the public schools. This list was obtained through the Computer Services Department at Eastern Illinois University. The Computer Services Department compiled a list of school speech-language pathologists and their places of employment during the 1991-92 school year from a computer program given to Eastern Illinois University by the
Illinois State Board of Education. The list contained a total of 2995 speech-language pathologists working in the public schools of Illinois.

After this list was obtained, 75 speech-language pathologists working in the high school setting were omitted from the study. Only speech-language pathologists who work in elementary school settings, (K-8), were included as possible subjects to complete the survey. Developmental apraxia is most likely to be diagnosed in the childhood ages of 3 to 6 years (Hall, 1989; Bernthal & Bankson, 1988). Therefore, speech-language pathologists who work in elementary schools were most likely to have diagnosed and treated children with developmental apraxia.

The list of speech-language pathologists working in elementary schools, a total of 2921 possible subjects, were split into five groups, with each group representing a different geographic region in Illinois. This assured that results represented children from every region across Illinois. (Appendix B) Group I was selected from all counties north of Interstate 80, from the Indiana border, and east of Rt. 47 to the Wisconsin border. This region was referred to as the "Chicagoland Area". Group II was selected from all counties west of Rt. 47 and north of Interstate 80 to the Quad Cities. This region was referred to as the "Northwest IL" region. Group III's region extended south of Interstate 80 and north of Interstates 72 and 74 from Danville west to the Missouri River. This region was labeled "Central IL". Subjects in Group IV were selected from counties south of Interstates 72 and 74 to Interstate 70 southwest to St. Louis. This region was referred to as "South Central IL". Group V subjects were from counties south of Interstate 70 to the southern border of Illinois. The region was referred to as "Southern IL".

Each speech-language pathologist on the Illinois State Board of Education list was assigned to one of the five geographic regions and then assigned a number for identification. Using Orlich's (1978) "Estimated Population and Sample Size" chart (taken from the National Education Association) as a guide to determine an appropriate sample
size, 340 subjects were chosen from the total population of 2921 (Orlich, 1978). For each region, 68 numbers/subjects were randomly chosen to complete the survey.

**Procedures**

A survey was mailed directly to the speech-language pathologists at their place of employment at the beginning of October, 1993. Included with the survey was a self-addressed stamped envelope for the subjects to use when returning the survey. A cover letter was also enclosed to explain the purpose of the survey, as well as directions for completing the questionnaire. (Appendix C) Each subject had one month from the date of receipt to complete the survey. Research has shown this to be a reasonable amount of time to complete a survey (Orlich, 1978). The subject also had the opportunity to request a copy of the results of the survey.

**Analysis**

The preliminary step used when analyzing the data was counting the number of responses for each question. This provided the investigator with some preliminary information about the prevalence of developmental apraxia, as well as the most or least frequently observed characteristics of developmental apraxia. In addition, the number of subjects who were Illinois Speech-Language-Hearing Association (ISHA) members, American Speech-Language-Hearing Association (ASHA) members, licensed speech-language pathologists or certified speech-language pathologists was determined.

Correlations were made based on the descriptive data. In addition, comparisons were made between the Regions' responses. For example, the regions were compared on the basis of how long they had been practicing speech-language pathology, as well as their feelings of competency in the diagnosis and treatment of developmental apraxia. Comparisons were also made between the respondents' feeling of preparedness and their education in the area of developmental apraxia. Responses were also compared between
the reported characteristics of the children with developmental apraxia across the different regions.
CHAPTER IV

RESULTS

The purpose of this study was to determine the following information: 1) the prevalence and characteristics of developmental apraxia in school-aged children in the public schools of Illinois; 2) subjects' academic training in the diagnosis and treatment of the disorder; and 3) demographic information about the subjects. One hundred and sixteen school speech-language pathologists served as subjects and supplied survey information. These subjects represented the actual number of speech-language pathologists who returned surveys from a random 30% (340) sampling of the 2995 speech-language pathologists employed in the public schools of Illinois.

At the beginning of the survey, the respondents were asked to indicate whether or not they had treated or diagnosed developmental apraxia. If they had not diagnosed and treated developmental apraxia, the respondents were instructed to skip to the last section of the survey and respond to only those questions. Therefore, the total number of speech-language pathologists responding to the survey questions did not correspond to the total number of returned surveys. In addition, many subjects did not respond to every question for reasons undetermined.

Research Question 1: What is the prevalence of developmental apraxia in the public schools of Illinois?

Results: Table 1 and 2 indicated the total number of responding speech-language pathologists who had treated children with developmental apraxia prior to the Fall of 1993 and the total number of speech-language pathologists, as of the Fall 1993, treating the disorder. In addition, Tables 3 and 4 present the total number of children the speech-language pathologists had treated in the past and present. Some respondents indicated that they had seen a multitude of children and were unable to give an exact number.
Regions:
1 - Chicagoland Area
2 - Northwest Illinois
3 - Central Illinois
4 - So Central Illinois
5 - Southern Illinois

TABLE 1. The total number of responding speech-language pathologists who had treated developmental apraxia prior to the Fall of 1993.

<table>
<thead>
<tr>
<th>Number of Children</th>
<th>Region</th>
<th>Total # of SLP</th>
<th>%'s</th>
</tr>
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<tbody>
<tr>
<td>1-2 children</td>
<td>1</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>2-3 children</td>
<td>2</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>3-4 children</td>
<td>3</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>4-5 children</td>
<td>4</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>5+ children</td>
<td>5</td>
<td>19</td>
<td>22</td>
</tr>
</tbody>
</table>

Total # of SLPs 21 16 17 13 18 85

The results showed that 30% of the speech-language pathologists who responded to this question had treated an average of 1-2 children prior to the Fall of 1993. Region 1 reported the highest number of speech-language pathologists diagnosing and treating the disorder prior to the Fall of 1993, whereas, Region 4 reported the lowest number. In Regions 2, 3, 4, and 5, most speech-language pathologists reported treating an average of 1-2 children prior to the Fall of 1993. Most Region 1 respondents reported seeing an average of 5+ children prior to the Fall of 1993.
TABLE 2. The total number of responding speech-language pathologists who are providing remedial services for the disorder in the Fall of 1993.

<table>
<thead>
<tr>
<th>Number of Children:</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
<th>Region 4</th>
<th>Region 5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>28</td>
<td>33</td>
</tr>
<tr>
<td>1-2 children</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>11</td>
<td>36</td>
<td>42</td>
</tr>
<tr>
<td>2-3 children</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3-4 children</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>4-5 children</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5+ children</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td>21</td>
<td>15</td>
<td>16</td>
<td>14</td>
<td>18</td>
<td>84</td>
<td></td>
</tr>
</tbody>
</table>

The table indicated that 42% of the respondents were currently treating between 1-2 children. Region 1 reported the highest number of speech-language pathologists responding to this question currently, as of the Fall of 1993, treating developmental apraxia. Seventy percent of those responding speech-language pathologists in Region 4, reported treating no children with developmental apraxia. Thirty three percent of the total population of respondents reported providing no remedial services for children with developmental apraxia.

TABLE 3. The total number of children treated by the responding speech-language pathologists prior to the Fall of 1993.

<table>
<thead>
<tr>
<th>Region:</th>
<th>Number of Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70-84</td>
</tr>
<tr>
<td>2</td>
<td>41-53</td>
</tr>
<tr>
<td>3</td>
<td>41-57</td>
</tr>
<tr>
<td>4</td>
<td>30-41</td>
</tr>
<tr>
<td>5</td>
<td>51-64</td>
</tr>
<tr>
<td>Total</td>
<td>233-269</td>
</tr>
</tbody>
</table>
The total number of children speech-language pathologists reported in the survey who had had developmental apraxia ranged from 233-269. Region 1 reported the highest incidence of children, whereas, Region 4 reported the lowest number of children seen prior to the Fall of 1993. Region 5 contained the second highest number of children. Regions 2 and 3 reported similar numbers of children treated with developmental apraxia. The exact incidence of children being seen prior to the Fall of 1993 was unable to be determined as many of the respondents were unable to provide an exact number. Therefore, a range of numbers resulted.

TABLE 4. The total number of children currently being treated by the responding speech-language pathologists as of the Fall of 1993.

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of children</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 -</td>
<td>26-41</td>
</tr>
<tr>
<td>2 -</td>
<td>15-25</td>
</tr>
<tr>
<td>3 -</td>
<td>28-40</td>
</tr>
<tr>
<td>4 -</td>
<td>4-8</td>
</tr>
<tr>
<td>5 -</td>
<td>23-38</td>
</tr>
<tr>
<td>Total -</td>
<td>96-152</td>
</tr>
</tbody>
</table>

The total number of children who were being treated, as of the Fall of 1993, (96-152) is lower than the number of children seen in the past (233-299). Regions 1 and 3 reported similar numbers of children. Region 4 reported the lowest number of children who were receiving services by speech-language pathologists who responded to the survey. Again, the respondents were unable to give exact numbers of children being seen; therefore, a range of numbers resulted.

The respondents were also asked to report on their experiences with the diagnosis and treatment of developmental apraxia. Results are presented in Table 5 and 6.
TABLE 5. Respondents who had diagnosed or treated developmental apraxia.

<table>
<thead>
<tr>
<th>Region:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>19</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>13</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>9</td>
<td>12</td>
<td>14</td>
<td>11</td>
<td>50</td>
<td>44</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td>23</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>24</td>
<td>113</td>
<td></td>
</tr>
</tbody>
</table>

The results indicated 55% of the total number of respondents had diagnosed developmental apraxia. Region 1 reported the highest number of speech-language pathologists diagnosing developmental apraxia. Regions 3 and 4 reported the lowest number of respondents diagnosing the disorder. In addition, Region 4 reported the highest number of speech-language pathologists responding to the survey who had not diagnosed developmental apraxia. Three subjects did not respond to this question as they were unable to diagnose children on the basis of the definition provided by the researcher.

TABLE 6. Respondents who had treated developmental apraxia.

<table>
<thead>
<tr>
<th>Region:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>21</td>
<td>15</td>
<td>18</td>
<td>14</td>
<td>18</td>
<td>86</td>
<td>74</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>29</td>
<td>25</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td>24</td>
<td>21</td>
<td>23</td>
<td>24</td>
<td>23</td>
<td>115</td>
<td></td>
</tr>
</tbody>
</table>

The table displayed that 74% of the respondents had treated developmental apraxia. Region 1 reported the highest number of speech-language pathologists who had treated developmental apraxia. Region 4 reported the lowest. Region 4 also reported the highest number of speech-language pathologists that had not treated developmental apraxia. One respondent was unable to complete this question, as well as the rest of the survey, as the subject reported working with children at the preschool age. Information was only to be obtained from the children within the K-8 grade range.
Research Question 2: What are the identifying characteristics observed in children who had been diagnosed with developmental apraxia?

Results: Respondents were requested to identify from a list of speech/language characteristics those that they most frequently observed in children with developmental apraxia. Table 7 contains a list of the ten most frequently observed characteristics reported in children with developmental apraxia, as well as the number of children reported with a certain characteristic. Refer to Appendix D for a total listing of characteristics.

TABLE 7. The ten most frequently reported characteristics of developmental apraxia.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - an increase of errors as the MLU increases</td>
<td>202 children</td>
</tr>
<tr>
<td>2 - omissions of sounds &amp; production of consonant clusters</td>
<td>191 children</td>
</tr>
<tr>
<td>3 - expressive language skills impaired</td>
<td>174 children</td>
</tr>
<tr>
<td>4 - production of slow diadochokinetic rates</td>
<td>171 children</td>
</tr>
<tr>
<td>5 - limited repertoire of sounds</td>
<td>169 children</td>
</tr>
<tr>
<td>6 - production of fricatives difficult</td>
<td>157 children</td>
</tr>
<tr>
<td>7 - delivery of speech difficult</td>
<td>155 children</td>
</tr>
<tr>
<td>8 - production of affricates difficult</td>
<td>143 children</td>
</tr>
<tr>
<td>9 - imitation skills poor</td>
<td>142 children</td>
</tr>
<tr>
<td>10 - distortions of sounds or syllables</td>
<td>135 children</td>
</tr>
</tbody>
</table>

An increase of errors as the mean length of utterance increases was the most frequently reported characteristic of developmental apraxia, as speech-language pathologists who responded to the question reported observing this characteristic in 202 children. Reported characteristics among regions were similar.

Information was also obtained regarding the average number of school years spent in therapy, the average of amount of time per week spent in therapy, the gender of the children, and the age of diagnosis for the children reported with developmental apraxia. These results are presented in the following tables (Tables 8-11).
TABLE 8. The average number of school years children with developmental apraxia spent in therapy.

<table>
<thead>
<tr>
<th>Number of years:</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
<th>Region 4</th>
<th>Region 5</th>
<th>Total # of children</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 years</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>2-3 years</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>1</td>
<td>6</td>
<td>26</td>
<td>16</td>
</tr>
<tr>
<td>3-4 years</td>
<td>15</td>
<td>5</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>46</td>
<td>28</td>
</tr>
<tr>
<td>4-5 years</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>5+ years</td>
<td>9</td>
<td>15</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>39</td>
<td>24</td>
</tr>
<tr>
<td>Total # of children</td>
<td>39</td>
<td>37</td>
<td>39</td>
<td>19</td>
<td>35</td>
<td>159</td>
<td></td>
</tr>
</tbody>
</table>

The results indicated that 28% of the children reported were seen for an average of 3-4 years. Regions 1, 3, 4, and 5 reported that most of the children they provided services for spent an average of 3-4 years in therapy. The speech-language pathologists who responded to this question in Region 2 indicated that the most amount of children spent an average of 5 or more years in therapy.

TABLE 9. The average amount of time per week children with developmental apraxia spent in therapy.

<table>
<thead>
<tr>
<th>Time/wk</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
<th>Region 4</th>
<th>Region 5</th>
<th>Total# of children</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x's a week:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 mins.</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20 mins.</td>
<td>9</td>
<td>7</td>
<td>1</td>
<td>7</td>
<td>8</td>
<td>32</td>
<td>38</td>
</tr>
<tr>
<td>25 mins.</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>30 mins.</td>
<td>15</td>
<td>5</td>
<td>14</td>
<td>1</td>
<td>5</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>40 mins.</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>45 mins.</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>60 mins.</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total # of children</td>
<td>30</td>
<td>12</td>
<td>15</td>
<td>11</td>
<td>13</td>
<td>83</td>
<td></td>
</tr>
</tbody>
</table>
Table 9b.

<table>
<thead>
<tr>
<th>Region</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of children</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x's a week:</td>
<td>15 mins.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>20 mins.</td>
<td>4</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>25 mins.</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>30 mins.</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>40 mins.</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>45 mins.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>60 mins.</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Total # of children</td>
<td>21</td>
<td>15</td>
<td>10</td>
<td>7</td>
<td>8</td>
<td>63</td>
<td></td>
</tr>
</tbody>
</table>

Table 9c.

<table>
<thead>
<tr>
<th>Region</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of children</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x's a week</td>
<td>20 mins.</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>30 mins.</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Total # of children</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>1</td>
<td>7</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

Table C displayed that 54% of the children seen 4 times a week were seen for 30 minutes each. Table A displayed that 48% of the children seen 2 times a week were seen for 30 minutes each. Table B displayed that 42% of the children seen 3 times a week were seen for 20 minutes.

TABLE 10. The gender of the children with developmental apraxia.

<table>
<thead>
<tr>
<th>Region</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of children</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td>Male</td>
<td>42</td>
<td>27</td>
<td>43</td>
<td>19</td>
<td>35</td>
<td>166</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>17</td>
<td>12</td>
<td>12</td>
<td>10</td>
<td>26</td>
<td>77</td>
</tr>
<tr>
<td>Total # of children</td>
<td>59</td>
<td>39</td>
<td>55</td>
<td>29</td>
<td>61</td>
<td>243</td>
<td></td>
</tr>
</tbody>
</table>

The results indicated that 70% of the total number of children reported were male children. Responses among regions are similar; however, Region 5 reported a significantly higher number of females.
TABLE 11. The age at which the diagnosis of developmental apraxia was made.

<table>
<thead>
<tr>
<th>Age of Diagnosis:</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
<th>Region 4</th>
<th>Region 5</th>
<th>Total # of children</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>under age 3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>3-5 years old</td>
<td>25</td>
<td>26</td>
<td>26</td>
<td>12</td>
<td>32</td>
<td>121</td>
<td>61</td>
</tr>
<tr>
<td>5-7 years old</td>
<td>23</td>
<td>7</td>
<td>14</td>
<td>6</td>
<td>5</td>
<td>55</td>
<td>27</td>
</tr>
<tr>
<td>7-9 years old</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>9+ years old</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Total # of children</td>
<td>52</td>
<td>99</td>
<td>52</td>
<td>24</td>
<td>46</td>
<td>198</td>
<td></td>
</tr>
</tbody>
</table>

Sixty percent of the speech-language pathologists who reported the age of diagnosis stated that the children's diagnosis were made at 3-5 years of age. Responses among regions were comparable; however, Region 1 reported comparable numbers of speech-language pathologists diagnosing children at 3-5 and 5-7 years of age.

The responding speech-language pathologists were asked to provide a list of the diagnostic assessment tools and therapy techniques which they found beneficial when working with children who had developmental apraxia. The results are displayed in Tables 12 and 13. For a complete listing of these tools and techniques, refer to Appendix E and F.

TABLE 12. The top five most beneficial assessment tools.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - NONE</td>
<td>39 respondents</td>
</tr>
<tr>
<td>2 - oral/motor examinations</td>
<td>11 respondents</td>
</tr>
<tr>
<td>3 - articulation tests</td>
<td>10 respondents</td>
</tr>
<tr>
<td>4 - phonology tests</td>
<td>8 respondents</td>
</tr>
<tr>
<td>5 - diadochokinetik rates</td>
<td>6 respondents</td>
</tr>
</tbody>
</table>

Thirty nine of the speech-language pathologists who provided assessment tools reported that they had not found any assessment tools to be beneficial in successfully identifying children with the disorder. However, those who did find successful assessment
tools used oral motor examinations, articulation and phonological tests, and
diadochokinetic rates to diagnose children with developmental apraxia. Responses among
regions were similar.

TABLE 13. The top five most beneficial therapy techniques.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- NONE -</td>
<td>23 respondents</td>
</tr>
<tr>
<td>2- oral motor exercises -</td>
<td>12 respondents</td>
</tr>
<tr>
<td>3- tactile cues -</td>
<td>11 respondents</td>
</tr>
<tr>
<td>4- visual cues -</td>
<td>7 respondents</td>
</tr>
<tr>
<td>5- phonological therapy -</td>
<td>6 respondents</td>
</tr>
</tbody>
</table>

Twenty-three speech-language pathologists who responded to this question reported that they had not found any beneficial therapy techniques. Those who did find successful therapy techniques reported oral motor exercises, visual and tactile cues, as well as phonological therapy to be successful when working with children who have developmental apraxia.

Research Question 3: Are school speech-language pathologists adequately prepared to diagnose and treat children with developmental apraxia?

Results: The results of this question were obtained by requesting the subjects to examine their own feelings of preparedness in treating and diagnosing the disorder. The results are presented in Tables 14 and 15. Information was also obtained regarding the education the speech-language pathologists had received in the area of developmental apraxia during their training in the field of communication disorders. Refer to Tables 16-19 for these results.
TABLE 14. The number of subjects that felt adequately prepared to diagnose and treat developmental apraxia.

<table>
<thead>
<tr>
<th>Region</th>
<th>Prepared?:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12 6 6 5 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>37 45</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>8 9 11 8 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45 55</td>
<td></td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td>20 15 17 13 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

Overall, 55% of the total number of subjects responding to this question did not feel adequately trained to diagnose and treat developmental apraxia. Sixty percent of the respondents in Region 1 did feel adequately trained to work with children who have developmental apraxia. In Region 5, the speech-language pathologists were equally split between feeling adequate and feeling inadequately trained to diagnose and treat the disorder. Regions 2, 3, and 4 reported results similar to the overall finding that speech-language pathologists did not feel comfortable working with the disorder.

TABLE 15. The number of subjects that felt inadequately prepared in treatment, diagnosis, or both.

<table>
<thead>
<tr>
<th>Region</th>
<th>Area:</th>
<th>Diagnosis</th>
<th>Treatment</th>
<th>Both</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>3 6 10 6 5</td>
<td>15 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>6 2 2 3 2</td>
<td>15 21</td>
<td>5 5 5 6 26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td>14 13 17 14 13</td>
<td></td>
<td></td>
<td></td>
<td>71</td>
<td></td>
</tr>
</tbody>
</table>

The results indicated that 42% of the total number of respondents to this question felt the least adequate in diagnosing the disorder. Regions 2, 3, and 4 reported the highest number of speech-language pathologists who felt the least adequate in diagnosis. Region 1 reported the highest number of speech-language pathologists feeling the least comfortable treating developmental apraxia. Region 5 differed in that the greatest number
of speech-language pathologists felt the least adequate in both the diagnosis and treatment of developmental apraxia.

TABLE 16. The number of SLPs who received training in developmental apraxia.

<table>
<thead>
<tr>
<th>Region</th>
<th>Training</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td>16</td>
<td>9</td>
<td>10</td>
<td>5</td>
<td>11</td>
<td>51</td>
<td>62</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>6</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td></td>
<td>20</td>
<td>15</td>
<td>16</td>
<td>14</td>
<td>17</td>
<td>142</td>
<td></td>
</tr>
</tbody>
</table>

From the total number of speech-language pathologists who responded to this question, 62% had received training in developmental apraxia. Regions 1, 2, 3, and 5 agreed with the overall result that most speech-language pathologists had received training in developmental apraxia. However, Region 4 reported 65% of the speech-language pathologists had not received training in the diagnosis and treatment of developmental apraxia.

TABLE 17. The type of training respondents received in developmental apraxia.

<table>
<thead>
<tr>
<th>Region</th>
<th>Training: 1 day sem.</th>
<th>2 day sem.</th>
<th>univ course</th>
<th>other</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day sem.</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>2 day sem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>univ course</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td>other</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td>23</td>
<td>17</td>
<td>13</td>
<td>11</td>
<td>12</td>
<td>76</td>
</tr>
</tbody>
</table>

Thirty six percent of the total number of speech-language pathologists, responding to this question, received training of developmental apraxia in a university course. Regions 1, 2, 3, and 5 reported similar findings. In region 4, 40% reported receiving training in the diagnosis and treatment of developmental apraxia by reading information on their own.
Speech-language pathologists who responded to the survey were given the opportunity to state whether they believed more classes were needed in the diagnosis and treatment of developmental apraxia. Of those responding to the question, 92% believed more classes were needed.

The survey also obtained information regarding demographic information. Questions were asked regarding the respondents' academic training, gender, years in practice and membership information. Their participation in continuing education was also examined. These results are presented in Tables 18-22.

TABLE 18. The respondents' academic training.

<table>
<thead>
<tr>
<th>Region</th>
<th>Training:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA/BS</td>
<td></td>
<td>1</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>MA/MS</td>
<td></td>
<td>22</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>88</td>
<td>80</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td></td>
<td>23</td>
<td>24</td>
<td>20</td>
<td>21</td>
<td>21</td>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

Eighty percent of the total number of speech-language pathologists responding to this question hold their master's degree. Results were similar among all regions; however, 2 respondents in Region 4 reported obtaining their master's degree in early childhood and learning disabilities.

TABLE 19. The respondents' gender.

<table>
<thead>
<tr>
<th>Region</th>
<th>Gender:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>22</td>
<td>16</td>
<td>18</td>
<td>19</td>
<td>19</td>
<td>94</td>
<td>98</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td></td>
<td>22</td>
<td>18</td>
<td>18</td>
<td>19</td>
<td>19</td>
<td>96</td>
<td></td>
</tr>
</tbody>
</table>
The results indicated that 98% of those who reported their gender were female. The only two male speech-language pathologists who responded to this question were from Region 2.

TABLE 20. The respondents' years in practice.

<table>
<thead>
<tr>
<th>Region</th>
<th>Years:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-3 years</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>3-6 years</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>6-9 years</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>9+ years</td>
<td>17</td>
<td>16</td>
<td>12</td>
<td>11</td>
<td>14</td>
<td>70</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Total # of SLPs</td>
<td>20</td>
<td>18</td>
<td>18</td>
<td>20</td>
<td>19</td>
<td>95</td>
<td></td>
</tr>
</tbody>
</table>

Seventy four percent of the speech-language pathologists who responded to this question had practiced for over 9+ years. Results from the individual regions were similar, however, Region 4 reported the highest number of speech-language pathologists who had only practiced for 1-3 years.

TABLE 21. The respondents' membership information.

<table>
<thead>
<tr>
<th>Region</th>
<th>Member:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISHA</td>
<td>9</td>
<td>5</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>38</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>ASHA</td>
<td>14</td>
<td>8</td>
<td>13</td>
<td>10</td>
<td>14</td>
<td>59</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>State Lic.</td>
<td>18</td>
<td>15</td>
<td>16</td>
<td>18</td>
<td>17</td>
<td>85</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>CCC's</td>
<td>19</td>
<td>9</td>
<td>14</td>
<td>12</td>
<td>12</td>
<td>65</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>none</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total # of SLPs</td>
<td>61</td>
<td>39</td>
<td>52</td>
<td>51</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results indicated that 33% of the total number of subjects responding to this question held a state license. Among regions, the highest percentages for membership information indicated that speech-language pathologists held a state license, Certificates of Clinical Competence, or were members of ASHA. Although these were the highest
percentages, the majority of the respondents did not have a license, Certificate of Clinical Competence, or were ASHA members. 2.3% of those responding to the question held no membership affiliation. Only 15% of the total number of speech-language pathologists responding to this question were members of ISHA.

TABLE 22. The respondents' continuing education activities.

<table>
<thead>
<tr>
<th>Region</th>
<th>Cont. Ed.:</th>
<th>Total # of SLPs</th>
<th>%s</th>
</tr>
</thead>
<tbody>
<tr>
<td>workshops</td>
<td>20 13 17 16 20</td>
<td>86</td>
<td>32</td>
</tr>
<tr>
<td>conventions</td>
<td>8 8 11 8 9</td>
<td>63</td>
<td>23</td>
</tr>
<tr>
<td>readings</td>
<td>15 14 15 12 13</td>
<td>69</td>
<td>25</td>
</tr>
<tr>
<td>wkly meetings</td>
<td>10 10 8 7 7</td>
<td>42</td>
<td>15</td>
</tr>
<tr>
<td>other</td>
<td>1 2 1 3 1</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Total # of SLPs</td>
<td>54 47 52 46 50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thirty-two percent of those reporting their continuing education activities frequently attended workshops as part of their continuing education and 25% participated in their own personal readings. Of those respondents from all regions that listed "other", the most frequently occurring type of continuing education were inservices and resources from other speech-language pathologists.
CHAPTER V
DISCUSSION

The results of this study provided an overview of the school speech-language pathologist in Illinois who diagnosed and/or treated developmental apraxia. In addition, a profile was developed of the children who were diagnosed with developmental apraxia. A discussion of those results follows.

Profile of the Children Diagnosed with Developmental Apraxia

The typical child who displayed a developmental apraxia of speech, in public schools of Illinois, was diagnosed with the disorder between the ages of 3-5 and was male.

The typical child displayed many of the same speech and language characteristics found in the literature. The number one reported characteristic in this study, production of an increase of errors as the MLU increases, has been sited in the literature by many authors (Yoss & Darley, 1974; Hall, 1989; Jaffe, 1986; Creaghead, Newman, & Secord, 1986). Omissions of sounds or syllables and production of consonant clusters, the second highest reported characteristics, has also been sighted in the literature by such authors as Chappell, 1973; Jaffe, 1986; Weiss, Gordon & Lillywhite, 1987; Marquadt & Sussman, 1991 and Love, 1992. The fact that those reported by the respondents correlated with those found in the literature suggest that researchers are well on their way to finding a unique set of characteristics designed to define the disorder.

When analyzing the characteristics of the children reported in this study, in general, the different regions reported the same characteristics. This further helped to designate a set of common characteristics which may be used to diagnose the disorder.

The typical child, who was diagnosed with developmental apraxia, spent an average of 3-4 years in therapy. This finding was not consistent with what was found in the literature. In the literature, it was stated that on an average, children with
developmental apraxia spend a long time in therapy; usually throughout all of elementary school, due to slow progress (Yoss & Darly, 1974; Love, 1992).

This difference may suggest that speech-language pathologists are identifying remedial techniques which are very successful with certain children and therefore, dismissing them sooner. However, as the majority of the respondents did not report a therapy technique that was successful with all children with the disorder, it was unlikely that children were dismissed due to successful therapy techniques. Due to the uncertainties these results raise, this issue should be researched further in the future.

The children seen by the respondents in this study, on an average, were seen 4 times a week for 20 minutes. Other frequent times were 2 times a week for 30 minutes and 3 times a week for 20 minutes. This information was encouraging. It has been stated in the literature that children with developmental apraxia need intensive therapy (Yoss & Darley, 1974; Love, 1992). Knowing that in a school system, seeing a child for 20-30 minutes is rare, having a child in therapy 4 times a week for 20 minutes is ideal. This may indicate that speech-language pathologists are utilizing the Illinois State Board of Education (ISBE) Severity Rating Guidelines.

Profile of the Speech-Language Pathologist

The typical speech-language pathologist responding to the survey practiced in the public schools for over 9 years and was female. She held a master's degree, a state license, and a Certificate of Clinical Competence.

In the public schools of Illinois, the responding speech-language pathologist provided services to an average of 1-2 children with developmental apraxia prior to the Fall of 1993 and currently. The responding speech-language pathologists are providing services for an average of 96-152 children which is significantly lower than the number of children, 233-269, seen prior to the Fall of 1993.
Possible reasons exist as to why the number of children currently being treated with developmental apraxia was lower than the number of children seen prior to the Fall of 1993. Preschool screenings were conducted in the spring semester of the previous school year. This survey was sent in October, therefore, it was likely that the preschool children who may display a possible apraxia have not yet been identified by the speech-language pathologists. In addition, better training in the diagnosis of developmental apraxia may exist now than in the past. Consequently, speech-language pathologists may be more knowledgeable about the disorder and subsequently, more appropriate diagnoses may result leading to fewer children being mislabeled.

A school speech-language pathologist might or might not have diagnosed and treated developmental apraxia. From the results of the survey, 55% of the responding speech-language pathologists diagnosed the disorder, whereas, 74% of the respondents treated developmental apraxia.

The reason for the highest percentage of speech-language pathologists treating the disorder became clear as further results indicated that 42% of the respondents felt the least comfortable in diagnosing children with the disorder. Therefore, the typical speech-language pathologist was likely to have received a diagnosis of the child from an outside diagnostic setting.

Although the majority of responding speech-language pathologists felt inadequately prepared to diagnose and treat developmental apraxia, nearly all of the respondents had received training in developmental apraxia at the university level. This may imply that speech-language pathologists had not received adequate training in the diagnosis and treatment of developmental apraxia during their university courses.

The majority of the respondents reported that they had not found any beneficial assessment and remediation tools that were successful with all children who had been diagnosed with developmental apraxia. However, the majority of speech-language pathologists relied on articulation, oral-motor, and phonology tests to diagnose the
disorder. For treatment, the speech-language pathologist utilized oral-motor exercises, tactile and visual cues, as well as phonological therapy.

This information correlated with what was found in the literature. If a speech-language pathologist was to go to the literature to find therapy techniques, she/he would be overwhelmed at the amount of different suggested therapy techniques. Numerous authors and researchers have suggested methods, but not one therapy approach was guaranteed to work with all children diagnosed with developmental apraxia. The same was true for diagnostic assessment tools.

**Differences Among Regions**

Differences existed among the responding speech-language pathologists among the five different regions included in the study. For example, speech-language pathologists in Region 1 (the Chicagoland area), reported treating an average of 5+ children prior to the Fall of 1993, and also reported the highest number of speech-language pathologists who were diagnosing and treating the disorder prior to the Fall of 1993. In addition, Region 1 reported the highest number of children receiving services prior to the Fall of 1993. Respondents in Region 4 (the So. Central Illinois area) reported the lowest number of speech-language pathologists diagnosing and treating the disorder in the past and the lowest amount of children receiving services prior to the Fall of 1993.

As of the Fall of 1993, Region 1 reported the highest number of speech-language pathologists that were treating the disorder as well as the highest number of children presently receiving services. Region 4 also reported the lowest number of children who were receiving services and speech-language pathologists who were treating developmental apraxia. In addition, 70% of the respondents in Region 4 reported currently not providing services for children with developmental apraxia.

The reasons for these differences were numerous. In Region 1, 80% of the respondents had received training in developmental apraxia, whereas, in Region 4, 64% of
the responding speech-language pathologists reported not receiving any training. Therefore, it may be easy to assume that Region 1 can more readily identify the disorder and treat it appropriately due to increased education regarding developmental apraxia. Better education for the diagnosis and treatment of the disorder may increase the number of speech-language pathologists treating and diagnosing developmental apraxia, which in turn, may increase the number of children receiving services.

Results obtained from Regions 2 (Northwest Illinois area), 3 (Central Illinois area), and 5 (Southern Illinois area) assisted in providing a profile of the average speech-language pathologist who was diagnosing and treating developmental apraxia. No significant differences were found among these regions.

Other differences among regions were also found when reporting whether speech-language pathologists felt adequately prepared to diagnose and treat developmental apraxia. For example, Region 1 reported the majority of the responding speech-language pathologists felt adequately prepared to diagnose and treat the disorder. This was expected as the majority of the respondents in this region were already diagnosing and treating the disorder.

In Regions 2, 3, and 4, the majority of the respondents did not feel adequately prepared to diagnose and treat the disorder. The lower prevalence data seen in these regions, as well as their limited exposure to the disorder during their education, provided an explanation to their feelings of inadequacy.

In addition, in Regions 2, 3, and 4, the majority of the responding speech-language pathologists felt the least adequate in the diagnosis of the disorder. Surprisingly, Region 1 respondents felt the least adequate in the treatment of the developmental apraxia. As of the Fall of 1993, the respondents in Region 1 are not providing services for as many children as they had prior to the Fall of 1993. Therefore, due to the lower number of children currently receiving treatment, the respondents at the time the survey was sent out, might have been feeling unprepared to treat developmental apraxia. In addition, the
preschool screenings might not have been conducted yet, and therefore, possible children with developmental apraxia were not yet diagnosed.

The demographic information reported earlier when describing the typical speech-language pathologist was similar among all regions. Only a few differences existed. The only 2 male respondents were from Region 2. In addition, in Region 4, two respondents reported obtaining their master's degree in early childhood and learning disabilities. These differences were found to be insignificant to the outcome of the study. However, it was important to note that Region 4 reported the highest number of respondents that had practiced for only 1-3 years. This may further add to the region's results of the overall feeling of inadequacy when dealing with developmental apraxia.

Weaknesses of the Study

A major weakness of this study was its limited ability to obtain specific characteristics reported for specific individual children. At the onset of the study, the differences among the individual children reported on the survey was to be examined. Therefore, the survey design allowed for speech-language pathologists to report up to five individual profiles for children they had treated with developmental apraxia. However, when the surveys were returned, the majority of the respondents were unable to comment on five different children due to their inability to remember the individual cases or their excessive numbers of (5+) children treated with developmental apraxia. Although this issue did not affect the validity of the study, it did limit the opportunities for making additional inferences and comparisons regarding developmental apraxia.

A second weakness of the study was its failure to obtain additional information from those respondents who reported never diagnosing or treating developmental apraxia. It would have been beneficial to have given the respondents a chance to explain why they felt they never came in contact with developmental apraxia. Without this information, it
was difficult to make statements regarding the reported lower incidences of developmental apraxia in some regions.

Another weakness of the study was its inability to determine a specific incidence of children with developmental apraxia. The respondents were unable to give a specific number due to their inability to remember the number of children they had treated. In addition, the survey did not allow for a specific number to be reported as the question itself provided a range of numbers (i.e., 1-2 children, 2-3 children, etc.) as choices.

Finally, the study failed to explain exactly why the speech-language pathologists did not feel adequately prepared to diagnose and treat developmental apraxia. Only speculations could be made on the basis of their response to their academic training and the number of children actually seen with developmental apraxia.

Conclusions and Need for Future Research

Need for future research. Future research is needed in the area of effective and successful therapy techniques, as well as assessment tools. It was clear that the responding speech-language pathologists were in need of additional assistance in these areas. In addition, future research can focus on the current curriculum which may or may not include developmental apraxia. From the overwhelming response from the speech-language pathologists in this study, more classes are needed to better educate speech-language pathologists about developmental apraxia. For those still in graduate or undergraduate training, coursework can focus on the research which includes developmental apraxia. For those speech-language pathologists already working in the public schools of Illinois, further education can be obtained through continuing education workshops, as the majority of the respondents attend workshops as part of their continuing education plan. Future research can also focus on the discrepancies in the literature and the results found in this study regarding the amount of time children with developmental apraxia spend in therapy.
Conclusions. Many conclusions can be made following the results of this study. First, developmental apraxia of speech is being diagnosed and treated by speech-language pathologists responding to this survey. Second, the characteristics found in the literature are the characteristics reported, i.e., speech/language symptoms, age of diagnosis, average amount of time spent per week in therapy, identified by the speech-language pathologists of Illinois who were included in this study. Thus indicating that research in the past has appropriately pinpointed the unique symptoms for the disorder.

On the whole, the majority of speech-language pathologists included in this study, do not feel adequately prepared to diagnose and treat developmental apraxia. More specifically, responding speech-language pathologists feel the least comfortable diagnosing the disorder. Speech-language pathologists who responded to the survey also feel more classes are needed in the areas of diagnosis and treatment of developmental apraxia, even though most of the respondents have received some training in the area. Therefore, researchers or professionals in the field should realize the need for more education in developmental apraxia. With continued education, speech-language pathologists may begin to feel more comfortable with the disorder, begin to more readily recognize and diagnose the disorder, and therefore, begin to remediate the children in such a way as to achieve the most success.
REFERENCES


APPENDIX - A
Survey

SECTION 1:

1. Have you ever diagnosed children with developmental apraxia based on the definition above?
   1) Yes ______
   2) No ______

2. Have you ever provided remedial services to children with developmental apraxia?
   1) Yes ______
   2) No ______ (If no, skip to question #18.)

3. If so, please indicate the total number of children you have treated with this disorder.
   1) 1-2 children ______
   2) 2-3 children ______
   3) 3-4 children ______
   4) 4-5 children ______
   5) 5+ children ______ (please specify the number ______)

4. Please indicate the number of children you are currently treating with this disorder.
   1) none ______
   2) 1-2 children ______
   3) 2-3 children ______
   4) 3-4 children ______
   5) 4-5 children ______
   6) 5+ children ______ (please specify the number ______)

Please answer the following questions, #5-11, for each child with developmental apraxia you have provided remedial services for. Please refer to the first child as child "1" and the second child as child "2", etc. When reporting a characteristic for a particular child, please circle the corresponding number to the left of each question.

5. Below are some common characteristics of developmental apraxia cited in the literature. Please check the characteristics you have observed in children.
   1) limited repertoire of sounds for child's chronological age ______
   2) omissions of sounds or syllables ______
   3) distortions of sounds or syllables ______
   4) additions of sounds or syllables ______
   5) repetitions of sounds or syllables ______
   6) prolongations of sounds ______
   7) production of fricatives difficult ______
   8) production of affricates difficult ______
   9) production of consonant clusters difficult ______
   10) production of increased errors as length of utterance increases ______
   11) production of vowel errors ______
   12) delivery of speech difficult ______
   13) imitation skills poor ______
   14) production of slow diadochokinetic rates ______
1. 15) production of a slow rate of speech
   16) receptive language skills unimpaired
   17) expressive language skills impaired
   18) inability to produce nonspeech movements (e.g., pucker the lips, blow out cheeks)
      on command
   19) incoordination of gross motor skills
   20) incoordination of fine motor skills
   21) inability to carry out the steps needed to complete a task
   22) production of nasal qualities inconsistent
   23) other

6. Please indicate the average number of school years children with developmental apraxia have spent in therapy.
   1) 1-2 years
   2) 2-3 years
   3) 3-4 years
   4) 4-5 years
   5) 5+ years (please specify)

7. Please indicate the amount of time per week the children have spent in remediation. Please indicate the amount of minutes per session as well.
   1) 2 times a week for minutes
   2) 3 times a week for minutes
   3) 4 times a week for minutes
   4) Other (please specify)

8. Please indicate the sex of the children you have seen with developmental apraxia.
   1) female
   2) male

9. Please indicate the age at which these children were diagnosed with developmental apraxia.
   1) under age 3
   2) 3-5 years old
   3) 5-7 years old
   4) 7-9 years old
   5) 9+ years old (please specify)

10. Please list any assessment tool(s) you have found beneficial in identifying children with developmental apraxia.
    

11. Please list any therapy techniques you have found successful when treating children with developmental apraxia. (Feel free to use additional paper if necessary.)
    

### SECTION 2:

12. I feel adequately trained to treat children with developmental apraxia.

1) True ______  
2) False ______

13. I feel the least adequate in:

1) Diagnosis ______  
2) Treatment ______  
3) both ______

14. I have received training in the diagnosis and treatment of developmental apraxia.

1) Yes ______ (If no, skip to #17.)
2) No ______

15. The training I have received in developmental apraxia was a:

1) one day seminar ______
2) two day workshop ______
3) university course ______
4) other ______ (please specify ______ )

16. I believe more classes are needed in training programs in order to appropriately serve children with developmental apraxia.

1) True ______
2) False ______

17. Please add any additional comments regarding whether or not your academic training prepared you to diagnose and treat children with developmental apraxia.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

________________________________________________________________________
SECTION 3:

18. Please check the following demographic characteristics as they pertain to you.

**Academic Training**

1) B.A./B.S. _____
2) M.A./M.S. _____
3) Ph.D. _____

**Gender**

1) Female _____
2) Male _____

**Years in Practice**

1) 1-3 years _____
2) 3-6 years _____
3) 6-9 years _____
4) 9+ years _____

**Membership Information**

1) ISHA member _____
2) ASHA member _____
3) Hold state license _____
4) Hold CCC's _____
5) no membership/certification _____

19. Are you involved in continuing education? If so, please indicate the type of continuing education you most frequently attend.

a) workshops _____
b) conventions _____
c) readings (from journals, articles, etc.) _____
d) weekly/monthly professional meetings _____
e) other _____ (please specify _____)

Check here if you would like a copy of the results from this study.

a) Yes _____
b) No _____

Thank you for completing the survey. Don't forget to return the survey in the self addressed stamped envelope by November 15, 1993.
APPENDIX B
MAP OF ILLINOIS AND REGIONS
Dear Speech-Language Pathologist:

I am a graduate student in the Department of Communication Disorders and Sciences at Eastern Illinois University in Charleston, Illinois. I am currently involved in completing my master's thesis to survey the prevalence of developmental apraxia of speech in Illinois school-aged children, K-8. In order to conduct this research, I am requesting your help in completing the enclosed survey.

The survey is divided into three sections. The first section asks for information regarding those children you have treated with developmental apraxia. The second section asks you questions regarding your education in the area of developmental apraxia. In the third section, questions are asked regarding your education, as well as other characteristics. Please feel free to provide any additional comments as you deem necessary. Your answers will remain anonymous and your name will not appear anywhere when reporting the results.

The following definition of apraxia may help you decide if you have treated or diagnosed any children with the disorder:

Developmental apraxia of speech is a childhood disorder characterized by the inability to program and coordinate the movements necessary to produce intelligible speech in the absence of impaired neuromuscular function (Yoss & Darley, 1974). (Specific characteristics are listed in question #5.)

When you have completed the survey, please return the form in the enclosed self-addressed stamped envelope by November 15, 1993. I appreciate the time you are taking to assist in my research procedures. If you have any questions, please feel free to contact me.

Sincerely,

Mary Jo Seibert, B.A.
Graduate Student
APPENDIX - D

Reported characteristics of developmental apraxia of speech

1 - production of an increase of errors as the MLU increases
2 - omissions of sounds or syllables and production of consonant clusters
3 - expressive language skills impaired
4 - production of slow diadochokinetic rates
5 - limited repertoire of sounds
6 - production of fricatives difficult
7 - delivery of speech difficult
8 - production of affricates difficult
9 - imitation skills poor
10 - distortions of sounds or syllables
11 - production of vowel errors
12 - incoordination of fine motor skills
13 - receptive language skills unimpaired
14 - incoordination of gross motor skills
15 - production of a slow rate of speech
16 - inability to produce nonspeech movements
17 - ideational apraxia
18 - repetitions of sounds or syllables
19 - additions of sounds or syllables
20 - production of nasal qualities inconsistent
21 - prolongations of sounds
APPENDIX - E

Beneficial Assessment Tools

1 - NONE
2 - oral motor examination
3 - articulation tests
4 - phonology tests
5 - diadochokinetic rates
6 - other checklists
7 - referrals to O.T.
8 - observations
9 - screening test for developmental apraxia
10 - language samples
11 - referrals to other professionals
12 - feeding assessment
13 - imitative sound assessment
14 - repetition of multisyllabic words
15 - imitate nonspeech movements
16 - EOWPVT - multisyllabic words
17 - therapist developed materials
18 - checklist for nonvolitional and volitional oral movements
19 - Test of Apraxia
20 - phonetic inventory
21 - evaluation of oral praxis
22 - Preschool apraxic battery
23 - oral sequencing
24 - tongue blades

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APPENDIX - F

Beneficial Therapeutic Techniques

1 - NONE
2 - oral motor exercises
3 - tactile cues
4 - visual cues
5 - phonological therapy
6 - repetition exercises
7 - mirror work
8 - kinesthetic cues
9 - drill
10 - O.T. and P.T.
11 - rate reduction
12 - VC combinations
13 - play therapy
14 - auditory cues
15 - multisensory approach
16 - whole language
17 - pictures
18 - chewing
19 - blowing
20 - diadochokinetic rates
21 - articulation therapy
22 - oral sensitivity
23 - auditory bombardment
24 - intonation patterns
25 - AAC
26 - homologous pairs
27 - early intervention
28 - discrimination
29 - music therapy
30 - tongue thrust therapy
31 - Touch Q Method
32 - MIT
33 - ice stroking
34 - positioning
35 - collaboration with other professionals
36 - word lists
37 - sign language
38 - tape recorder
39 - phonemic synthesis