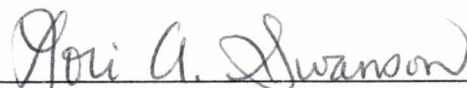
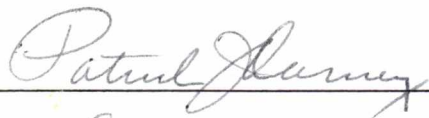


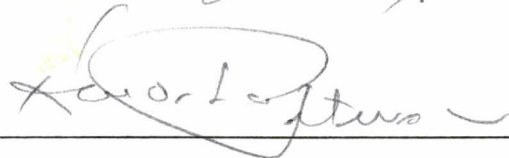
To the Graduate Council:

I am submitting herewith a thesis written by Carolyn A. Drake entitled "Evidence of Phonological Awareness, Language, and Auditory Processing Deficits in School-Aged Children with Serious Emotional Disturbance." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Speech Pathology.


Lori A. Swanson, Major Professor

We have read this thesis and recommend its acceptance:







Accepted for the Council:


Associate Vice Chancellor and
Dean of The Graduate School

**EVIDENCE OF PHONOLOGICAL AWARENESS, LANGUAGE,
AND AUDITORY PROCESSING DEFICITS IN SCHOOL-AGED
CHILDREN WITH SERIOUS EMOTIONAL DISTURBANCE**

**A Thesis
Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville**

**Carolyn Ann Drake
December 1996**

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ABSTRACT

This study was designed to determine the incidence of phonological awareness, language, and auditory processing deficits in 32 children with serious emotional disturbance [SED]. The children were aged 7:9 (years:months) to 15:4. The results indicated that a great majority of the subjects, 96.9%, exhibited phonological awareness deficits as measured by the Lindamood Auditory Conceptualization Test-Revised Edition (Lindamood & Lindamood, 1979). A significant number of subjects also demonstrated concomitant language and auditory processing deficits. Language problems were demonstrated for 90.6% of the subjects as evaluated by the Clinical Evaluation of Language Fundamentals-Revised Screening Test (Semel, Wiig, & Secord, 1989). Auditory processing deficits were exhibited by 81.3% of the subjects as assessed by A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986) or A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994). Finally, the evidence gathered through this investigation was examined to determine whether significant relationships existed between the subjects' ages and their performances on the measures of phonological awareness, language, and auditory processing skills or between the presence of attention deficit hyperactivity disorder [ADHD] or attention deficit disorder [ADD] and these same measures. Although a significant relationship was found between age and scores on the SCAN and SCAN-A, it is likely that the unusual grouping of subjects around the cut-off age between these test versions accounts for this

finding. No relationship was found between ADHD or ADD and the subjects' performance on any of the assessment instruments.

The results of this investigation show that deficits in phonological awareness, language, and auditory processing are significant components of the profile presented by a school-aged child with SED. This investigation found, as did Camarata, Hughes, and Ruhl (1988), that the communication problems of children with SED are frequently masked by the serious consequences of mental illness. Early screening of phonological awareness, language, and auditory processing abilities in children diagnosed with emotional or behavioral disorders is essential to eliminate underservice of communication disorders in this population.

Effective communication treatment approaches are greatly needed for this special population. Integrated, multidisciplinary treatment for children with SED and communication problems is most appropriate because concomitant psychiatric and communication disorders influence so many areas of a child's life, including his/her self image, academic performance, relationships among peers and within families, as well as the ability to understand and participate in therapeutic counseling. Multidisciplinary treatment will require collaboration among a team consisting of the child's parents, speech-language pathologist, psychologist, psychiatrist, physician, social worker, audiologist, special education and classroom teachers, and other professionals as needed to ensure appropriate assessment and treatment of children with SED and communication disorders.

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CHAPTER I

Introduction and Purpose of the Study

Introduction

This study examines the evidence of phonological awareness, language, and central auditory processing deficits in school-aged children with serious emotional disturbance [SED]. If evidence of deficits is found in skills related to the knowledge of sound structure, receptive and/or expressive language, and the ability to auditorily process language, such information will further describe the characteristics of communication problems in this population. It would also indicate the need to include assessment of phonological awareness, language, and auditory processing skills in routine evaluations of children with serious emotional disturbance.

Co-occurrence of Emotional and Behavioral Disorders and Communication Disorders in School-Aged Children

Various terms are used to designate psychiatric disability in children, such as emotionally handicapped, emotionally disturbed, and behaviorally disordered. Serious emotional disturbance [SED] is a classification used in the public schools to describe children with academic and/or social difficulties associated with psychiatric problems.

SED is inclusive of both emotional and behavioral disorders. Therefore, SED will be used in this document when discussing psychiatric disorders in school-aged children.

Previous research has identified a high co-occurrence rate of SED and communication disorders in school-aged children. Early evidence was gathered by Cantwell and Baker (1977) in a review of literature which found behavioral disorders in 64% of children with language disorders. In subsequent studies, researchers reported incidence figures for co-occurring emotional and/or behavioral disorders and communication disorders ranging from 44% to 80% (Baker & Cantwell, 1987b; Beitchman, Nair, Clegg, Ferguson, & Patel, 1986; Cantwell & Baker, 1991; Grinnell, Scott-Hartnett, & Glasier, 1983; Kotsopoulos & Boodoosingh, 1987; Westman, Ownby, & Smith, 1987). Although subject selection and assessment measures varied across these studies, a general prevalence rate of approximately 60% is widely accepted for co-occurring SED and communication disorders in school-aged children (Butler, 1990). This constitutes a sizeable number of children at risk for speech and language disorders who may be underserved because of a masking effect due to the serious consequences of their psychiatric problems (Camarata, Hughes, & Ruhl, 1988; Cohen, Davine, & Meloche-Kelly, 1989).

Significant Deficits in Auditory Processing Found in Children With Concomitant Psychiatric and Communication Disorders

Having established that a significant number of children with SED also exhibit communication disorders, researchers have begun to examine the relationship between

psychiatric and speech and language disorders. Three different hypotheses have been developed to explain this relationship: (1) psychiatric disorders lead to communication disorders; (2) communication disorders lead to psychiatric disorders; or (3) a common underlying factor leads to both communication and psychiatric disorders (Prizant et al., 1990). In an effort to identify a possible common underlying factor, investigators recently have examined the contribution of auditory processing deficits to the development of concurrent psychiatric and communication disorders. In fact, Baltaxe and Simmons (1990) stated that the "clearest examples of communication handicaps and psychiatric disorders that share underlying processing deficits are auditory processing deficits" (p. 29).

Evidence of significant deficits in auditory processing skills has been found in children with concomitant SED and language disorders. Investigators targeting this population have reported incidence figures for auditory processing disorders ranging from 50% to 85% (Baker & Cantwell, 1982; Gualtieri, Koriath, Van Bourgondien, & Saleeby, 1983; Kotsopoulos & Boodoosingh, 1987; Rudy, Smith, & Walters, 1994, September 26). While researchers have identified auditory processing problems in this population, little information has been obtained regarding specific subskills (e.g., phonological awareness) thought to contribute to the functioning of the central auditory system. However, Kotsopoulos and Boodoosingh (1987) reported that 52% of their subjects demonstrated speech sound processing deficits, making this the largest area of deficit of the six speech-language parameters which were assessed. This research points toward phonological awareness as a possible area of weakness for children with SED.

Phonological Awareness: A Subskill of Auditory Processing Important to Reading and Spelling Skills

An important component of auditory processing is phonological awareness, a skill crucial to the manipulation of language during reading and spelling. Phonological awareness includes knowledge that words are composed of syllables and phonemes which can be altered to make words rhyme, begin, or end with the same sound (Catts, 1991). Swank and Catts (1994) defined phonological awareness as "sensitivity to the sound structure of the language," which allows one to associate sounds with their orthographic symbols (p. 10). Once this association is made, reading becomes a process of decoding the orthographic symbols into sounds; while spelling involves the reverse, or encoding the sounds into orthographic symbols (Swank & Catts, 1994). Studies indicate that children develop phonological awareness on two levels, first learning to recognize syllabic units and then discriminating the individual sounds or phonemic units (Swank, 1994). Swank stated that phonological awareness leads to metaphonology, or the ability to perform mental operations on phonological information. Thus a reader is able to compare an unfamiliar word with known phonemic rules to decode and, at least, pronounce the word. Poor readers, however, are deficient in phonological awareness and metaphonologic skills. Research has supported the contention that poor word, syllable, and sound awareness puts children at risk for academic problems, and reading problems in particular (Kamhi, Lee, & Nelson, 1985). In fact, the level of phonological awareness in pre-readers has proven an effective predictor of their later reading success (Blachman, 1991).

Little information is available regarding phonological awareness skills in school-aged children with concomitant SED and communication disorders. An indication that this may be an area of concern comes from the few studies which have examined the academic performance of these children. Because phonological awareness is essential to the decoding process in reading, it is reasonable to assume that reading deficits might indicate problems with phonological awareness as well. In fact, a few studies have identified reading problems in this population (Harris, King, Reifler, & Rosenberg, 1984; Kotsopoulos & Boodoosingh, 1987; Westman et al., 1987). As mentioned, a number of researchers have found a significant incidence of both central auditory processing deficits and reading and spelling deficits in school-aged children with concomitant psychiatric and communication disorders. Specifically, Kotsopoulos and Boodoosingh (1987) found speech sound processing deficits in children with SED while determining an incidence of language disorders in this population. Deficits in phonological awareness, along with language and auditory processing, may well be characteristic of school-aged children with SED.

Summary

Communication disorders may be overlooked in children with accompanying emotional and/or behavioral disorders, perhaps due to the serious effects of their psychiatric problems (Camarata et al., 1988; Cohen et al., 1989). Within recent years, researchers have examined the co-occurrence of SED and communication disorders in school-aged children and reported co-occurrence rates ranging from 40% to 80%

(Beitchman et al., 1986; Cantwell & Baker, 1977, 1987, 1991; Grinnell et al., 1983; Kotsopoulos & Boodoosingh, 1987; Westman et al., 1987). Generally, a prevalence rate of approximately 60% is accepted for co-occurring SED and speech and language disorders in school-aged children (Butler, 1990). In an effort to better understand the relationship between SED and communication disorders in children, researchers have examined auditory processing deficits as possible underlying problems common to both types of disorders. Evidence of significant deficits in auditory processing skills have been found in approximately 50% to 85% of children with concomitant SED and language disorders (Baker & Cantwell, 1982; Gualtieri et al., 1983; Rudy et al., 1994, September 26). Although the subskills which contribute to the functioning of the central auditory system have seldom been examined in this population, evidence of reading and spelling problems suggest there may be deficits in phonological awareness (Harris et al., 1984; Kotsopoulos & Boodoosingh, 1987; Westman et al., 1987). Many researchers have stressed the importance of more completely describing the relationships between psychiatric disorders and communication disorders in children (for reviews see Prizant et al., 1990, and Cantwell & Baker, 1991). Speech-language pathologists, in particular, have been urged to more accurately define the characteristics of speech and language disorders found in children with co-existing psychiatric disorders (Camarata et al., 1988; Cohen et al., 1989).

Purpose of the Study

The purpose of this study is to further define language deficits in school-aged children with serious emotional disturbance [SED]. For children in a public school setting, SED is an educational designation which indicates a diagnosis of an emotional and/or behavioral disorder that adversely affects academic and/or social functioning. Specifically, therefore, this study will determine whether phonological awareness deficits, as assessed by performance on the Lindamood Auditory Conceptualization Test-Revised Edition [LAC] (Lindamood & Lindamood, 1979), occur in children (CA=5:0 to 16:11) who have been certified with SED. The LAC examines the following skills which are encompassed by phonological awareness: auditory discrimination (the ability to distinguish speech sounds); auditory perception (the ability to recognize individual sounds, their number, and their sequence in syllables or words); and auditory conceptualization (the ability to visually represent the identity, number, and sequence of sounds in syllables or words). It may be that phonological awareness deficits are, as suggested by the work of Kotsopoulos and Boodoosingh (1987), a significant part of the diagnostic profile presented by children with concomitant SED and communication disorders.

A secondary purpose of this study is to determine whether children with SED have language and auditory processing deficits, as demonstrated by performance on the Clinical Evaluation of Language Fundamentals-Revised Screening Test (Semel, Wiig, & Secord, 1989) and A Screening Test for Auditory Processing Disorders (Keith, 1986) or A Test for Auditory Processing Disorders in Adolescents and Adults (Keith, 1994). Positive

findings would support the high incidence of language disorders and auditory processing deficits previously reported (Baker & Cantwell, 1982; Beitchman et al., 1986; Cantwell & Baker, 1977, 1987, 1991; Grinnel et al., 1983; Gualtieri et al., 1983; Kotsopoulos & Boodoosingh, 1987; Rudy et al., 1994, September 26; Westman et al., 1987).

This study will examine the relationship, if any, between chronological age and performance on measures of phonological awareness, language, and auditory processing skills by school-aged children with SED. A possible relationship between attention deficit hyperactivity disorder or attention deficit disorder and deficits of phonological awareness, language, and auditory processing skills will also be investigated. Such relationships, if identified, would further describe the characteristics of communication disorders exhibited by school-aged children with SED.

CHAPTER II

Definitions and Review of Literature

Definitions

Psychiatric Disorders in School-Aged Children

Psychiatric disorders in children are diagnosed on the basis of criteria stated in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition [DSM-IV] (American Psychiatric Association, 1994). The DSM-IV taxonomy consists of five axes which include: Axis I, clinical psychiatric syndromes; Axis II, developmental disorders; Axis III, medical-biological disorders; Axis IV, contributing psychosocial stressors; and Axis V, overall levels of impairment and adaptive functioning (Cantwell & Baker, 1991, p. 42). Commonly, psychiatric disorders in children are separated into two categories: emotional disorders, in which the individual's symptoms are considered to be internalized, and behavioral disorders, in which the symptoms are externalized (Audet & Ripich, 1994). Examples of emotional disorders include bipolar disorder, anxiety disorder, and depression; while behavioral disorders include attention deficit hyperactivity disorder, oppositional-defiant disorder, and conduct disorder. Each of these disorders has been identified as having a high rate of concomitance with communication disorders in children (Audet & Ripich, 1994). In fact, the most common psychiatric disorder co-occurring with

communication disorders is attention deficit hyperactivity disorder (Baker & Cantwell, 1982; Beitchman et al., 1986).

Attention Deficit Hyperactivity Disorder: A Behavioral Disorder Commonly Occurring With Language Disorders

Diagnosis of attention deficit hyperactivity disorder [ADHD] or attention deficit disorder [ADD] is made on the basis of criteria defined by the DSM-IV (American Psychiatric Association, 1994). This criteria consists of nine behavioral symptoms included under the heading of inattention and nine symptoms under hyperactivity/impulsivity. For a diagnosis of ADHD [DSM-IV 314.01], a child must manifest six or more symptoms of inattention and/or six or more symptoms of hyperactivity/impulsivity for at least six months. These symptoms must have occurred prior to age seven and occurred more frequently than would be expected of mental-age peers. These maladaptive symptoms must also occur in two or more settings and create impairment of social, academic, or occupational functioning. ADD [DSM-IV 314.00] requires the presence of six or more symptoms of inattention only. Although this most recent DSM definition separates ADHD from ADD, previous definitions did not. Therefore, past studies often referred to the disorder as "attention deficit disorder, undifferentiated."

A study of 284 five-year-olds illustrated the frequency with which attentional deficits are found in children with SED and language disorders (Beitchman et al., 1986). The subjects' language skills were evaluated with three standardized tests. Standardized

intelligence and developmental tests, along with checklists and scales completed by teachers and parents were used for psychiatric evaluations. Over 30% of the sample received diagnoses of undifferentiated attention deficit disorder. Attention deficit disorder was the leading psychiatric disorder (18%) in a study of 180 children with both SED and language problems (Westman et al., 1987). An even higher incidence of ADHD/ADD (68%) was found in 75 language-impaired preschool subjects selected from an outpatient psychiatric program (Love & Thompson, 1988). Clearly, as Westby and Cutler (1994) have maintained, "ADHD is closely associated both with speech and language problems and with mental health and behavioral problems" (p. 61). Again, research has yet to reveal the details of the relationship between ADHD, a common component of SED, and communication disorders.

Serious Emotional Disturbance: An Educational Designation Indicating Emotional and/or Behavioral Disorders

The definition of serious emotional disturbance [SED] arose from the "Education for All Handicapped Children Act of 1975" (Public Law 94-142, 1975, November 29), which guaranteed special education and related services for children with disabilities and also established criteria for eligibility to receive these services. The federal criteria defining emotional disturbance has been adopted, with some modifications, by over 40 of the state boards of education to certify children for special education services in the public schools (Camarata et al., 1988). In Tennessee, a number of the federal criteria have been included in the state certification process for special education services under the

designation of "serious emotional disturbance" (Tennessee State Department of Education, 1993).

To receive the designation of SED in Tennessee, a student must exhibit one or more of five specific behavioral characteristics "over an extended period of time and to a marked degree;" and, furthermore, these behaviors must adversely affect the student's educational performance (Tennessee State Department of Education, 1993, p. 17.1). The behaviors selected as criteria for SED include:

(a) an inability to learn which cannot be explained by intellectual, sensory, or health factors; (b) an inability to build or maintain satisfactory interpersonal relationships with teachers or peers; (c) inappropriate types of behavior or feelings under normal circumstances; (d) a general pervasive mood of unhappiness or depression; (e) a tendency to develop physical symptoms or fears associated with personal or school problems. (Camarata et al., 1988, p.192).

Eligibility for SED certification is determined by a licensed psychologist or psychiatrist along with the student's parents and teachers. Because SED is an educational category, it does not relate directly to diagnostic categories defined by the DSM-IV (American Psychiatric Association, 1994). However, many of the children certified as SED are also diagnosed with behavioral and/or emotional disorders. Certification as SED entitles the student to receive special education services, including those of the school speech-language pathologist. The high correlation between SED and communication disorders in school-aged children indicates that speech and language services are greatly needed by this group.

Review of Literature

Educational and psychiatric literature has clearly established that serious emotional disturbance [SED] and other behavioral and emotional disorders frequently co-occur with language disorders. However, the nature of the relationship between psychiatric disorders and language disorders remains unclear. It is unknown whether one disorder causes or maintains the other. It is possible that a third underlying factor may cause or contribute to the development of both SED and language disorders. A separatist's approach to assessment of children in this population may be partially to blame for this lack of knowledge (Butler, 1990). Butler stated that there was a considerable emphasis on the psychological aspects of speech-language pathology in its early years as a profession. In later years, however, the behaviorist's approach of Skinner and the developmental theories of Piaget and Chomsky led to a more narrowly defined view of speech and language disorders. With current trends toward viewing communication in terms of pragmatics and in naturalistic contexts, there is an emphasis on the whole individual within his/her environment, a view which includes the influences of emotional and mental health on communication effectiveness. Butler thus stressed the importance of a return to this profession's early interest in the relationship between psychological and communicative disorders. A similar point was made by Brinton and Fujiki (1993) who warned against considering language impairment as an isolated entity, separate from the child's socio-emotional functioning. To do so would, according to the authors, prevent "an understanding of how language impairment affects an individual's ability to communicate

and, ultimately, an individual's quality of life" (p. 195). Brinton and Fujiki thus supported the stance taken by Doherty and Hummel (1990), who recommended that the speech-language pathologist look for etiologies or influences on language development and disorders from a broad perspective including "thoughts, feelings, and past experiences" (p. 41). Cantwell and Baker (1977), among the earliest researchers of co-occurring SED and speech and language problems in children, urged further research to "help separate out etiological factors from associated concomitant factors" (p. 590). Researchers were still attempting to identify and differentiate these factors a decade later.

Intelligence Quotient: Possible Factor Underlying Concomitant SED and Language Disorders in the School-Aged Child

In their attempt to further identify factors associated with SED and language disorders, Camarata et al. (1988) examined the question of whether mildly-to-moderately behavior disordered children, with varying intelligence, were at risk for language disorders. In answering this question, the researchers found evidence to eliminate one possible contributor to the co-occurrence of SED and language disorders, i.e., intelligence quotient [IQ]. In addition, this study revealed that language problems are frequently overlooked in this population. These authors urged future research to further describe the characteristics of the language deficits children with SED so often exhibit.

In this study, Camarata et al. (1988) examined the language skills of 38 mildly-to-moderately behavior disordered children who were placed at least part-time in special education classrooms within regular elementary schools. Subject criteria included normal

academic achievement and mainstreaming for at least one course. The subjects ranged in age from 8:9 (years:months) to 12:11 with a mean age of 10:11. Intelligence quotients ranged from 67 to 126 with a mean of 94.2, as determined by one of four standardized intelligence tests. The Test of Language Development-Intermediate [TOLD-I] (Hammill & Newcomer, 1982) was used to assess language skills. Camarata et al. reported that 27 of the 38 subjects (71%) achieved scores at least two standard deviations below the normative mean on at least one of the TOLD-I subtests and 10 of the remaining 11 subjects (91%) achieved scores one standard deviation below the mean on at least one subtest. To account for differences in IQ between the sample and normative groups, the authors compared performance of the 21 children whose IQ matched that of the normative group and found that 95% of them still received standard scores greater than one standard deviation below the mean on at least one of the TOLD-I subtests. Therefore, the authors concluded that IQ was not a factor in the performance of children with SED during language assessment with the TOLD-I. Performance of subjects with *mild-to-moderate* behavioral disorders on the TOLD-I indicated that these children, similar to those with *serious* emotional disturbance [SED], are at risk for language and learning problems. In spite of finding a high co-occurrence of language and behavioral disorders, the authors noted that less than 6% of the subjects had received speech-language treatment. Camarata et al. concluded, therefore, that a speech-language assessment is warranted for all behaviorally disordered children. The researchers further stressed the need for future investigations to broaden the language assessment protocol, as the TOLD-I subtests examine only a portion of the many domains of language.

A more comprehensive speech and language protocol was utilized in a study of 37 children, aged 5 to 12 years, who were evaluated at a Toronto mental health facility (Cohen et al., 1989). The authors sought to (1) determine the prevalence of undiagnosed language disorders and (2) identify any differences between language disorders previously diagnosed and those newly diagnosed through the study. The assessment protocol covered: receptive and expressive syntax, semantics, and phonology, as well as pragmatics. The results indicated a prevalence of language disorders of 52%. Twenty-four percent had been previously diagnosed, but 28% of the sample had a moderate or severe language disorder that had not been identified. Examination of IQs indicated that language disorders could not have been determined by discrepancies between verbal and nonverbal scores and were revealed only through a comprehensive assessment of speech and language skills. With regard to the study's second question, no difference in types of language disorders was found between the previously and newly diagnosed groups with one exception: children with previously diagnosed language disorders had more receptive phonological problems. The authors noted that receptive phonological deficits have been linked with reading problems. They reported that 55% of the previously diagnosed group exhibited reading disabilities and were receiving remediation for learning disabilities. The researchers claimed that the failure to identify language disorders in a significant number of emotionally disturbed children is a serious concern. Without treatment, language deficits may detrimentally affect the child's social, academic, emotional, and cognitive development. Cohen et al. further stated that language deficits would impact psychiatric assessment and treatment because these procedures rely heavily on language use. These

authors concluded, as did Camarata et al. (1988), that a routine speech and language assessment should be included when children with SED are evaluated.

The need to identify speech and language disorders in children with SED was underscored by the findings of Mack and Warr-Leeper (1992). They studied 20 males ranging in age from 9:11 (years:months) to 13:7 who were inpatients in an Ontario psychiatric institute and were diagnosed as behaviorally disordered. To assess oral language skills, the authors administered 11 standardized speech and language tests covering auditory memory, semantic comprehension, syntactic comprehension, semantic expressions, and syntactic expression. They reported that 80% of the sample demonstrated a clinically significant speech and/or language impairment. This figure was estimated by the authors to be ten times greater than the prevalence of language disorders in the normal population; however, the finding of such a high co-occurrence of language and behavioral disorders was comparable to the previously mentioned figure of 71% reported by Camarata et al. (1988). Interestingly, the authors found that complex syntax, abstract semantics, and metalinguistic knowledge were particular areas of weakness for their subjects with SED. Mack and Warr-Leeper also examined the influence of IQ on the high co-occurrence of SED and communication disorders among their subjects. The mean full scale IQ for the subjects was 96.9. Language and full scale IQ scores were converted into z scores to determine whether the language skills differed significantly from what would be expected based on cognitive ability. Fifty percent of the subjects scored at or below the cutoff point (-1.414) on four or more subtests, indicating language skills significantly below expectations based on full scale IQ. Although IQ has traditionally been

used as an indicator of communication abilities, IQ scores could not be used to predict problems with speech and language in this or other studies (Camarata et al., 1988; Cohen et al., 1989; Mack & Warr-Leeper, 1992).

In summary, prevalence rates for the co-occurrence of SED and language disorders ranged from 52% to 80% in the studies described. The prevalence of language disorders was estimated to be ten times higher for children with SED than for the normal population (Mack & Warr-Leeper, 1992). Camarata et al. (1988) and Cohen et al. (1989) found significant numbers of subjects who exhibited language disorders which had been overlooked and therefore had gone untreated. Consequently, these researchers stressed the need to evaluate speech and language skills when assessing children with SED. In search of underlying factors responsible for the high concomitance of SED and language disorders, the effect of intelligence quotient was examined. Neither the full scale IQ score nor a discrepancy between verbal and performance IQ scores could be related to subject performance on language tests (Camarata et al., 1988; Cohen et al., 1989; Mack & Warr-Leeper, 1992). However, deficits in receptive phonology, reading, and metalinguistic skills were linked to poor performance on language tests in this population (Cohen et al., 1989; Mack & Warr-Leeper, 1992). Identification of these factors pointed to possible problems in the areas of auditory processing and phonological awareness for children with concomitant SED and language disorders.

Central Auditory Processing Disorder Found in School-Aged Children With SED

"Auditory processing" refers to the use individuals make of an auditory signal (Katz, Stecker, & Henderson, 1992). The term "central auditory processing" eliminates the peripheral hearing mechanisms and considers only the central auditory system's response to an auditory signal. Katz et al. (1992) described the central auditory system, from the olivary complex in the brainstem to the auditory cortex, as controlling a variety of tasks including attention, detection, and identification of an auditory signal; sound localization; and decoding of sound patterns, transmitted as neural signals, into meaningful stimuli. The system also sequences, organizes, stores, and retrieves auditory information. In a discussion of the bases of central auditory processing, Ferre (1987) described subtasks of attention, perception, memory, and linguistic-cognitive functions. Ferre maintained that problems in any of these subsystems would contribute to central auditory processing dysfunction and noted that children with learning disabilities performed significantly poorer than normal peers on such tasks. Sloan (1991) defined the primary characteristic of central auditory processing disorder [CAPD] as the inability to "process the rapidly changing acoustic properties of speech" (p. 49). She noted that subjects with CAPD showed great variability in the degree of their disorder. However, Sloan noted one common characteristic among the subjects was an associated language impairment or learning disability. Katz et al. (1992) identified learning disabilities as the most common problem which has been associated with CAPD. Within the area of learning disabilities, Katz et al. suggested that reading problems may be most directly related to auditory perceptual problems. These authors cited studies which also linked central auditory

processing deficits to disorders of speech, voice, and both receptive and expressive language. Additionally, Katz et al. observed that researchers have found associations between central auditory processing deficits and disorders such as attention deficit hyperactivity disorder [ADHD] and schizophrenia, along with other psychiatric disorders.

Some of the earliest studies identifying auditory processing deficits in this population described the language deficits of juvenile delinquents. For example, Zinkus and Gottlieb (1979, 1983) reported a relationship between auditory processing deficits and academic problems in juvenile delinquents. Their first study of 60 incarcerated males (mean age = 15.9 years) examined auditory memory with subtests from standardized measures of intelligence. Fifty-eight percent of the subjects exhibited auditory memory deficits, which the authors stated caused a "serious impairment of academic skills" (Zinkus & Gottlieb, 1979, p. 25). Thirty institutionalized male delinquents were the subjects of the second study (Zinkus & Gottlieb, 1983). Auditory processing skills were evaluated with subtests from the Detroit Tests of Learning Aptitude [DTLA] (Baker & Leland, 1967). Reading, spelling, and arithmetic skills were examined with the Wide Range Achievement Test [WRAT] (Jastack & Jastack, 1965). While the mean age of the subjects was 15:8 (years:months), the mean DTLA age-equivalent score was 9:9 (years:months), indicating nearly a five year delay in auditory processing skills. Analyses of variance were performed and compared for DTLA and WRAT test scores, which revealed that those subjects with auditory processing deficits performed significantly poorer than other subjects in the areas of reading, spelling, and arithmetic. Katz and Harrison (1988, November) reported similar findings, stating that 90% of 147 incarcerated male and female juveniles demonstrated

auditory processing deficits as measured by the Staggered Spondaic Word Test (Katz, 1986) and the Phonemic Synthesis Test (Katz, 1983).

A study of 291 children attempted to link certain speech and language disorders with specific psychiatric disorders (Baker & Cantwell, 1982). Although clear correlations were not found between specific communication and psychiatric disorders, information was derived regarding several possible common underlying factors, including auditory processing deficits. The subjects were divided into three groups: (1) speech disorders only; (2) language disorders only; (3) both speech and language disorders. The prevalence and types of psychiatric disorders were analyzed for each group. As other researchers have found, undifferentiated attention deficit disorder was the most common psychiatric disorder in all three groups (Beitchman et al., 1986; Westby & Cutler, 1994; Westman et al., 1987). Forty-five percent of the total sample evidenced clinical psychiatric disorders. Interestingly, the incidence of psychiatric disorders varied among the groups with only 29% in the speech disordered group, 45% in the speech and language disordered group, and 95% in the language disordered group. Differences were found among the groups in auditory processing disorders as well, with none reported for the speech disordered group, 50% for the speech and language disordered group, and 89% for the language disordered group. Specifically, deficits occurred in auditory discrimination, reception, short-term memory, association, and/or closure. These results pointed to a strong relationship among psychiatric, language, and auditory processing disorders.

Similar findings were reported by Gualtieri et al. (1983) in their study of 40 subjects, mean age 9:4 (years:months), who were referred to a child psychiatry inpatient

service. The primary purpose of this investigation was to determine the prevalence of communication disorders in the sample of children with SED, which was 50%. As in the previously discussed studies, the authors found that 45% of the subjects demonstrated language abilities below levels expected on the basis of IQ (Camarata et al., 1988, Cohen et al., 1989, Mack & Warr-Leeper, 1992). In addition to standardized language tests, the authors examined auditory processing skills, targeting the following areas: auditory analysis, auditory memory, auditory integration, receptive language, and expressive language. Test instruments included the Goldman-Fristoe-Woodcock Auditory Skills Test Battery (Woodcock, 1976), Denver Auditory Phoneme Sequencing Test (Aten, 1979), Detroit Tests of Learning Aptitude (Baker & Leland, 1967), The Auditory Analysis Test (Rosner & Simon, 1971), Auditory Integrative Abilities Test (Grote, 1976), Token Test (McNeil & Prescott, 1978), and Illinois Test of Psycholinguistic Abilities (Kirk, McCarthy, & Kirk, 1968). Forty-six percent of the subjects achieved scores equal to or lower than two standard deviations below the mean on these tests. However, when examining scores lower than one standard deviation below the mean on specific auditory processing tasks these results were found: 65% failed tasks of auditory analysis, 55% exhibited problems with auditory memory, and 78% demonstrated errors in auditory integration tasks. Therefore the findings of this study, like that of Baker and Cantwell (1982), revealed significant auditory processing deficits in children with concomitant SED and language disorders.

The high incidence of auditory processing deficits and poor language skills reported in the research may implicate these weaknesses as underlying or even primary

causes of emotional or behavioral problems in children (Rudy et al., 1994, September 26). To this author's knowledge, Rudy et al.'s study was the first attempt to focus primarily on the auditory processing skills in this population. As previously mentioned, these authors investigated the incidence of central auditory processing disorder [CAPD] in 20 children admitted to the child psychiatric unit of a metropolitan medical center. The children received both a psycho-educational and a speech and language assessment. The subjects were admitted as inpatients with one of the following psychiatric disorders as defined by the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (American Psychiatric Association, 1980): oppositional defiant disorder, conduct disorder, attention deficit hyperactivity disorder, dysthymia, and post-traumatic stress disorder. The children ranged in age from 5 to 11 years ($M = 9:3$). Seventeen were males and three were females. Subject criteria included normal hearing as assessed with bilaterally presented pure tones at 25 dB HL and impedance testing. Subjects also demonstrated normal intelligence with full scale IQs above 85, as assessed by the Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974).

The Clinical Evaluation of Language Fundamentals-Revised [CELF-R] (Semel, Wiig, & Secord, 1987) was used to assess receptive and expressive language skills. Subtests for children ages 5 to 7 years included: linguistic concepts, sentence structure, oral directions, word structure, formulated sentences, recalling sentences, and sentence assembly. For children eight years and older, the subtests covered the following areas: oral directions, word classes, semantic relationships, formulated sentences, recalling sentences, and sentence assembly. A Screening Test for Auditory Processing Disorders

[SCAN] (Keith, 1986) was administered in a double-walled test booth to evaluate problems with central auditory processing. The SCAN subtests utilize the following stimuli: low-passed filtered words, monosyllabic words presented with speech babble noise for an auditory figure-ground task, and monosyllabic word pairs presented dichotically with simultaneous onset times. Thus, the first two subtests of the SCAN present stimuli in contexts which either distort the auditory signal or present it against background noise to evaluate tolerance of poor acoustical environments. The third subtest utilizes competing signals presented to both ears as a method of assessing the developmental status of the subject's auditory system.

Results reported by Rudy et al. (1994, September 26) revealed that 70% of the sample had a language deficit reflected by a score on the CELF-R at or below the 16th percentile. When examining the CELF-R subtests on the basis of receptive or expressive language tasks, the authors reported that 82% of the subjects achieved scores at or below the 16th percentile on either the receptive or expressive subtests. This finding was in agreement with previous reports of the high incidence of language disorders in children with SED (Beitchman et al., 1986; Cantwell & Baker, 1977, 1987, 1991; Grinnel et al., 1983; Kotsopoulos & Boodoosingh, 1987; Westman et al., 1987). Performance on the SCAN's tasks of auditory processing indicated that 65% of the subjects had scores at or below the 16th percentile. The authors examined subject performance on the SCAN's individual subtests and found that 85% performed at or below the 16th percentile on at least one subtest. They concluded that poor performance on individual subtests indicated probable deficits in central auditory processing skills in these children. This study,

therefore, indicated that a significant portion of the psychiatrically disordered subjects not only demonstrated language problems, but also exhibited substantial deficits in central auditory processing skills. Finding a high incidence of central auditory processing deficits (85%) in this population supported previously reported figures, which ranged from 58% to 90% (Baker & Cantwell, 1982; Gualtieri et al., 1983; Katz & Harrison, 1988; Zinkus & Gottlieb, 1979, 1983). Rudy and coworkers did not, however, describe the phonological awareness abilities of their subjects who exhibited problems with central auditory processing.

While primarily evaluating the frequency and degree of language impairment in children with SED, Kotsopoulos and Boodoosingh (1987) reported information regarding phonological awareness skills such as speech discrimination at the phoneme, syllable, and word levels and auditory memory for sentences. Kotsopoulos and Boodoosingh (1987) stated that "deficient sound processing and psychiatric disturbance are often associated in children" (p. 232). In fact, they found auditory processing problems in children with SED who had no previously diagnosed articulation or language disorders. Their subjects were 46 children, aged 6 to 13 years, attending a child psychiatric program. Receptive and expressive language skills were evaluated with the Clinical Evaluation of Language Functions (Semel-Mintz & Wiig, 1980) and receptive single-word vocabulary was examined with the Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981). Twenty-six of the subjects were assessed with additional measures of speech and language to complete their communication evaluation. For example, speech was evaluated as necessary with the Goldman-Fristoe Test of Articulation (Goldman & Fristoe, 1986).

Speech and/or language disorders were found in 71.7% of the subjects. Speech sound processing abilities were assessed with the Lindamood Auditory Conceptualization Test (1971). The LAC measures auditory discrimination and conceptualization, or phonological awareness, of speech sounds. Lindamood and Lindamood (1979) described the skills targeted by this instrument as: "(1) the ability to discriminate one speech sound from another, and (2) the ability to perceive and compare the number and order of sounds within spoken patterns" (p. vii). The authors suggested that reading and spelling skills require the ability to conceptualize, or mentally envision, the "identity, the number, and the sequence of sounds in spoken patterns" and then conceptualize "the points of contrast between patterns" (p. vii). Fifty-two percent of the subjects evaluated with the LAC by Kotsopoulos and Boodoosingh (1987) demonstrated severe speech sound processing deficits, making this the largest area of deficit of the six speech-language parameters which were assessed. Further, the authors found that a majority of their subjects were reading below their chronological class level, which supported previous findings of the frequent association between reading disabilities and psychiatric disorders in children. These findings lent strong support to the premise that auditory processing deficits are a significant component of co-occurring SED and language disorders in children. In addition, the authors pointed to the sound processing skills evaluated by the LAC as a possible area of weakness in this population. However, observing that the relationship among reading deficits, language disorders, and SED remained unclear, Kotsopoulos and Boodoosingh offered no conclusions regarding phonological awareness deficits and their impact on children with SED.

Phonological Awareness Deficits May Be Characteristic of Children With SED

Phonological awareness is a metalinguistic skill which involves conscious manipulation of phonemes (Webster & Plante, 1992). Considerable evidence supports the importance of adequate phonological awareness skills in early reading ability (e.g., Blachman, 1991; Catts, 1991). Decoding is an important component of reading ability. Researchers have demonstrated a relationship between phonological awareness and decoding skills (e.g., Mann & Liberman, 1984; Swank & Catts, 1994). Phonological awareness has proven essential to the recognition that orthographic symbols represent the sounds in spoken words, which is the decoding element of reading. In fact, researchers have identified a causal relationship between phonological awareness and reading achievement based on evidence that provision of phonological awareness instruction improved reading and spelling acquisition in early elementary school-aged children (Blachman, 1991).

Although investigators have rarely examined phonological awareness skills in children who have SED and possibly co-occurring language deficits, they have more often examined these skills in children with language impairments alone (Kamhi et al., 1985). Kamhi et al. compared metalinguistic awareness of sounds, syllables, and words in 15 language impaired [LI] children, aged 5 to 6 years, with 15 normally developing [ND] children matched for mental age and 15 ND children matched for language age. Phonological awareness was measured through segmentation tasks, asking the children to "say just a little bit" of sentences, phrases, and finally words (e.g., saying "boat" for a little bit of "sailboat" and then saying "boa" for a little bit of "boat"). Findings indicated that

both sets of controls (mental-age and language-age) performed significantly better than the LI subjects on these tasks of phonological awareness. More than half of the LI subjects failed to segment any sentences or words into smaller units. The LI group had particular difficulty dividing monosyllabic words into smaller sound units. The researchers concluded that deficits in word, syllable, and sound awareness (i.e., phonological awareness) placed these children at risk for reading problems.

The findings of Catts (1993) supported the relationship between speech-language impairments and reading disabilities previously reported by Kamhi et al. (1985). Catts assessed 56 kindergartners with speech-language impairments (mean age, 6:2) using a battery of standardized speech and language tests as well as three measures of rapid naming and two measures of phonological awareness. The phonological awareness tasks included deletion (e.g., child says "all" after removing /t/ from "tall") and blending (e.g., child says "soap" when given the phonemes one at a time). The same assessment was given to 30 children with normal speech and language skills. Reading achievement was evaluated in the first and second grades for the subjects and controls. The word identification and word attack subtests from the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987) were administered in the spring of both the first and second grades, and the Gray Oral Reading Test-Revised (Wiederholt & Bryant, 1986) was given in second grade only. The speech-language impaired subjects achieved lower reading scores in both the first and second grades than the normally developing controls. When examining subgroups of speech impairment only [SI] and language impairment only [LI], the LI group performed significantly more poorly in reading than the SI group. Multiple

regression analyses were performed to examine which assessment measures given in kindergarten best predicted reading outcomes in the first and second grades. Results showed that measures of phonological awareness and rapid naming proved to be the best predictors of reading outcome when reading was assessed on the basis of word recognition. Catts thus concluded that deficits in phonological awareness and rapid naming were significantly associated with deficits in recognizing printed words. In fact, he stated that rapid naming and phonological awareness deficits "lie near the core of reading disabilities in young children" (Catts, 1993, p. 955). When discussing clinical implications, Catts stressed the importance of the early assessment of these skills and suggested the use of standardized measures of phonological awareness such as the Lindamood Auditory Conceptualization Test-Revised Edition (Lindamood & Lindamood, 1979).

While researchers have not examined phonological awareness deficits in children with SED, some information is available regarding reading deficits in children with SED and learning disabilities (Harris et al., 1984; Westman et al., 1987). Harris et al. examined two groups of children aged 6 to 13 years: one group of 40 in a school for children with learning disabilities [LD], and the other group of 50 in a school for children with serious emotional disturbance [SED]. The main focus of the study was to examine the emotional and behavioral profiles of the two groups, finding that 50% of the LD group exhibited symptoms of psychiatric disorders. A secondary purpose was to determine reading achievement in both groups. Teachers provided a reading level for each child based on achievement tests. The test score was then compared to an expected reading score, which was calculated based on the child's chronological age at the time of testing. A negative

discrepancy score was interpreted as reading achievement below normal. Achieved reading levels of both groups of children were more than two years below age-expected reading levels. This study provided evidence of significant reading deficits in children with SED. Whether decoding skills, and hence phonological awareness skills, were deficient was not shown.

Further evidence of reading deficits in children with SED was provided by Westman et al. (1987) who reported on 180 children aged 6 to 18 years referred for evaluation of learning disabilities. Seventy-seven percent of these children were diagnosed with psychiatric disorders. Standardized testing also revealed that 60% evidenced reading deficits and 72% had spelling deficits. Again, no information was provided regarding possible deficits in subskills which contributed to poor performance in reading and spelling, such as phonological awareness.

In summary, Harris et al. (1984) and Westman et al. (1987) have found significant reading deficits in children with SED. Problems with phonological awareness have been shown to contribute to reading deficits (Blachman, 1991; Catts, 1991, 1993; Kamhi et al., 1985; Swank & Catts, 1994; Webster & Plante, 1992). Children with SED have demonstrated speech sound processing deficits (Kotsopoulos & Boodoosingh, 1987). It may be that deficits in phonological awareness skills contribute, in part, to reading deficits exhibited by some children with both language impairment and SED. It is possible, then, that problems with phonological awareness are a component of the deficits in central auditory processing and language that children with serious emotional disturbance often demonstrate.

Thus, the purposes of this investigation were as follows:

(1) to determine whether children aged 5:0 to 16:11 (years:months) who have been certified with serious emotional disturbance [SED], exhibit phonological awareness deficits, as measured by performance on the Lindamood Auditory Conceptualization Test-Revised Edition [LAC] (Lindamood & Lindamood, 1979);

(2) to determine whether school-aged children with SED evidence language and auditory processing deficits, as demonstrated by performance on the Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test] (Semel et al., 1989) and A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986) or A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994);

(3) to determine whether there are significant relationships between chronological age and deficits in phonological awareness, language, and/or auditory processing skills for subjects certified as SED; and

(4) to determine whether significant relationships exist between attention deficit hyperactivity disorder or attention deficit disorder [ADHD, ADD] and deficits in phonological awareness, language, and/or auditory processing skills for subjects certified as SED.

CHAPTER III

Method

The questions raised in this study were examined through analysis of secondary data derived from a review of patient charts supplied by a local mental health facility for children in Knoxville, Tennessee. This facility operates a private psychiatric treatment program for school-aged children. It has an on-site school for grades kindergarten through twelfth and residential facilities for approximately thirty students. Psychiatric and medical care is provided to on-site residents and students of the school, many of whom are housed in a number of group homes throughout the community. A few of the students live at home with their parents. The directors of this facility granted the investigator permission to access their clients' charts to extract data for the purposes of this research project. Data were selected from the charts of clients who met the criteria for subject selection.

Subject Selection

Data were selected from the charts of the 32 clients who met the criteria for subject selection. Subject criteria were as follows: subjects must be between the ages of 5:0 (years:months) and 16:11, certified as seriously emotionally disturbed [SED], have an IQ of 70 or above, possess normal or corrected-to-normal visual acuity, have normal

hearing sensitivity and motor skills, and be medically stable if on a pharmacological regimen. The 32 subjects ranged in age from 7:9 (years:months) to 15:4, with a mean age of 12:2. Table 1 provides the distribution of subjects across age ranges. As can be seen, most of the subjects clustered between 11 and 13 years of age. Educational records were used to determine whether each subject was currently certified as seriously emotionally disturbed. No effort was made to counterbalance for gender due to the few number of females in this mental health facility. The subjects included 31 males and one female. A summary of the subjects' descriptions is given in Appendix A.

The subjects' intelligence test scores had been obtained, on average, within the previous two years. The majority of subjects had been evaluated with the Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974) or the Wechsler Intelligence Scale for Children-III (Wechsler, 1991). Three subjects had been evaluated with the Stanford-Binet Test of Intelligence (Terman & Merrill, 1973). Full-scale intelligence quotients [FSIQ] ranged from 71 to 117, with a mean FSIQ of 87. (For individual FSIQ scores, see Appendix A.) All subjects had normal or corrected-to-normal visual acuity, normal hearing sensitivity of at least 25 dB HL at 1000, 2000, and 4000 Hz, and normal motor skills to eliminate the confounding factors of physical deficits on test performance. In addition, the pharmacological treatment regimens of all subjects were stabilized at the time of testing, as verified by the treatment center staff, to ensure that their test performances were representative of their abilities.

Table 1

Distribution of subjects across age ranges

Age Ranges	Number of Subjects
7:0 - 7:11	1
8:0 - 8:11	2
9:0 - 9:11	1
10:0 - 10:11	2
11:0 - 11:11	5
12:0 - 12:11	12
13:0 - 13:11	4
14:0 - 14:11	3
15:0 - 15:11	2

Note. Age is given as years:months.

Additional information was extracted from the subjects' charts to indicate academic grade and psychiatric diagnosis or diagnoses (including the presence of a diagnosis for attention deficit hyperactivity disorder or attention deficit disorder). School grade levels ranged from second to ninth, with the majority of the subjects being in the sixth grade. Psychiatric disorders of each subject, listed by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition [DSM-IV] (American Psychiatric Association, 1994) codes are contained in Appendix B. Twenty-two of the subjects had multiple diagnoses which included a diagnosis of ADHD. One subject was diagnosed with ADD in addition to an emotional disorder. Appendix C, which summarizes the psychiatric disorders and the number of subjects diagnosed with them, clearly shows that ADHD/ADD was the most common psychiatric diagnosis.

To derive information regarding phonological awareness, language, and auditory processing skills, scores from one standardized test and two standardized screening assessments administered within the previous two months were recorded. The instruments which had been used included the following: Lindamood Auditory Conceptualization Test-Revised Edition [LAC] (Lindamood & Lindamood, 1979), Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test] (Semel et al., 1989), A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986), and A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994).

Confidentiality of subject identity was assured by assigning a subject number as data were gathered from each chart. These subject numbers were used throughout the

data analysis rather than subject names. The master list containing individual names and corresponding subject numbers was maintained by the executive director of the mental health facility in locked storage within his private office.

As the original data collection was performed by this author, a brief description of the stimuli and procedures used is given here. Then a discussion is offered regarding analyses of the data from a retrospective approach.

Original Data Collection

Stimuli

One standardized test and two standardized screening instruments had been administered to each of the subjects. As stated above, these included the Lindamood Auditory Conceptualization Test-Revised Edition (Lindamood & Lindamood, 1979), the Clinical Evaluation of Language Fundamentals-Revised Screening Test (Semel et al., 1989), and A Screening Test for Auditory Processing Disorders (Keith, 1986) or A Test for Auditory Processing Disorders in Adolescents and Adults (Keith, 1994).

Lindamood Auditory Conceptualization Test-Revised Edition

The Lindamood Auditory Conceptualization Test-Revised Edition [LAC] (Lindamood & Lindamood, 1979) was administered as a measure of phonological awareness. It can be given to anyone who understands the concepts of sameness and difference, numbers one to four, and left-to-right progression. A brief pretest of five items

is given to ensure the subject understands these concepts. Test stimuli are one to four phonemes spoken by the examiner in various patterns (e.g., /g, b, v/). As directed by the examiner, the subject responds to the stimuli by arranging colored blocks on the desk from left to right to represent the sounds heard in the auditory pattern (e.g., one red block for /g/, a blue block for /b/, and a yellow block for /v/).

The LAC consists of three subtests. Category 1-A contains 10 stimulus patterns requiring the ability to discriminate how many phonemes are heard in the pattern and whether they are the same or different phonemes (e.g., as described above, the subject places red, blue, and yellow blocks to represent /g, b, v/). Category 1-B contains 6 stimulus patterns requiring similar abilities to discriminate the number and sameness or difference between three phonemes, plus their sequential order (e.g., the subject places a red, a white, and another red block for the sounds /n, l, n/). Category II consists of 12 items, beginning with a single phoneme and building to a four-phoneme pattern (e.g., the subject first places green, yellow, and red blocks to represent the syllable /vap/ and then adds a white block to change the syllable to /vaps/). These items test the subject's ability to conceptualize phonemic changes in nonsense patterns. The changes include addition, substitution, omission, shifting, or repetition of phonemes within the pattern. There are two test forms for the LAC, Forms A and B. The subjects in this investigation were evaluated with Form B.

Raw scores for the LAC are converted on the record form, with the total possible converted score being 100. Criterion scores (Recommended Minimum Scores) are provided by grade level, from kindergarten through the seventh grade, for the first and

second halves of the school year. Beyond grade seven, adult performance is expected. The authors stated that minimum scores were set high to "ensure early identification of auditory-conceptual judgment" (Lindamood & Lindamood, 1979, p. 27). Subjects in the present investigation were in grades two through nine. As testing had been done near the end of the school year, the subjects' scores were compared to minimum scores recommended for the second half of the school year. LAC passing scores for grades two through seven-plus at the second half of the school year are as follows (grade/recommended minimum score): 2/71, 3/81, 4/86, 5/93, 6/99, and 7+/99.

Lindamood and Lindamood (1979) stated that 80% of children should exhibit no errors in Categories 1-A or 1-B by the end of first grade. However, as auditory conceptualization skills do not necessarily improve with maturity without intervention for some individuals, by adulthood one-third of the general population will exhibit mild to severe deficits in the phonological awareness skills which are evaluated by the LAC (Lindamood & Lindamood, 1979, p. 32). (See Appendix D for a further description of this test.)

Clinical Evaluation of Language Fundamentals-Revised Screening Test

Although previous investigations of the language abilities of children with SED utilized the Clinical Evaluation of Language Fundamentals-Revised [CELF-R] (Semel et al. 1987), the Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test] (Semel et al., 1989) was used in this study to measure receptive and expressive language skills. The CELF-R (Semel et al., 1987) was used by Rudy and

coworkers (1994, September 26) as a measure of language abilities in their study of children with SED. The CELF-R is a comprehensive standardized diagnostic instrument with 11 subtests which assess receptive and expressive language skills. The validity and reliability of the CELF-R are well established (Peterson & Marquardt, 1994).

For the current investigation, a battery of screening instruments (i.e., the CELF-R Screening Test, SCAN, and SCAN-A) and the LAC were chosen to expedite evaluation of the subjects who, because of their disorders, had limited attentional abilities. Validity for the CELF-R Screening Test was reported by the authors in terms of its agreement with the full version, the CELF-R. Correlations between the screening and the full version ranged from .66 to .87 and are given as "strong evidence of concurrent validity" (Semel et al., 1989, p. 51). In a comparison of 2,119 subjects' pass/fail scores on the CELF-R and the CELF-R Screening Test, overall agreement between the two instruments in discrimination of disordered subjects from normal subjects was 87.6%. Confidence ranges for avoiding false negative errors were reported between 93% and 99%. Reliability for the CELF-R Screening Test was based on results of a test-retest study of 128 subjects selected from the standardization sample for ages 6, 10, and 14 years. The authors reported good test-retest reliability for the CELF-R Screening Test with Pearson product-moment correlation coefficients ranging from .68 to .87. This information indicates that the CELF-R Screening Test has good sensitivity and specificity as a language screening instrument. The CELF-R Screening Test was, therefore, considered an appropriate tool with which to examine the language abilities of the subjects in the current investigation.

Receptive language skills evaluated by the CELF-R Screening Test include linguistic concepts, categorical relationships, and semantic relationships. Expressive language skills such as word structure, formulating sentences, and recalling sentences are also tested. For receptive language tasks, the subject responds to the examiner's directions by pointing to appropriate drawings or words in the stimulus manual. The subject responds orally to items which screen expressive language skills.

The CELF-R Screening Test contains six subtests. Children aged 5 to 7 years are given Subtests 1 through 3 which assess knowledge of morphological rules, understanding of linguistic concepts presented as oral directions, and sentence imitation abilities. Ages 8 through 12 receive Subtests 2 through 6 which add the tasks of understanding relationships between word concepts, interpreting semantic relationships, and sentence formulation ability. Ages 13 through 16 take Subtests 3 through 6.

Age-based criterion scores were developed to indicate a cut-off score for each age level to determine pass/fail of the CELF-R Screening Test. These scores are as follows (age/cut-off score): 7/19, 8/24, 9/28, 10/31, 11/34, 12/36, 13/32, 14/34, 15/35. (See Appendix E for a further description of the test.)

A Screening Test for Auditory Processing Disorders and A Test for

Auditory Processing Disorders in Adolescents and Adults

Subjects were administered A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986), if aged 5 to 11 years, or A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994), if aged 12 years or older. Both

versions assess the ability to attend to, discriminate, recognize, or comprehend information presented auditorily. Test stimuli consist of monosyllabic words which are tape recorded and presented through headphones. A Marantz audio recorder, model PMD430, with Sony headphones, model MDR-V600, were used to present the stimuli. The SCAN consists of three subtests. For subjects 12 or older, the SCAN-A includes the three subtests of the SCAN with the addition of a fourth subtest. Stimuli for Subtest 4 are competing signals at the sentence level.

Standard scores were developed for both the SCAN and SCAN-A from frequency distributions within the normative groups for each instrument. The mean for both tests is 100, with a standard deviation of 15. Standard scores falling lower than one standard deviation from the mean (<85) indicate further diagnostic evaluation should be done. Therefore, pass/fail of the SCAN and the SCAN-A is based on the cut-off score of 85. As this investigation considered whether age is related to auditory processing skills, it might be noted that the author of the SCAN-A found no significant differences between age groups within the standardization sample of this instrument (Keith, 1995). He reasoned that no difference was to be expected due to normal maturity of the auditory system by age 12 years.

The SCAN correlated moderately (.572, $p < .01$) with another test of auditory processing, the Staggered Spondaic Word Test (Katz, 1986). The SCAN-A was able to discriminate between individuals known to have CAPD versus individuals without CAPD 86% of the time (Keith, 1994). The SCAN and SCAN-A were therefore considered

appropriate screening tools for identification of auditory processing problems. (See Appendix F for a further description of the SCAN and Appendix G for the SCAN-A.)

Procedures

The subjects were seen individually for three sessions, which were all conducted in a quiet, carpeted room within the mental health facility. The first assessment session was five minutes in length, during which the subject's hearing was screened with pure tone audiometry and tympanometry. Administration of the standardized test and screening instruments began with the second session, which was conducted within two days of the first and was approximately 45 minutes in length. Testing was completed during the third session, which was held within one week of the second session and was also approximately 45 minutes in length.

Session One

A Beltone Special Instruments 120 portable audiometer, calibrated to ANSI 3.6-1989 standards (American National Standards Institute, 1989), was used to verify normal hearing acuity for subsequent administration of A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986) or A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994). The examiner explained to each subject that she would screen his/her hearing. Before the headphones were fitted, the subject was instructed to raise his/her hand each time a tone was heard. Pure tones were then presented to the right ear and then the left ear at 20 dB HL for 1000 and 2000 Hz

and 25 dB HL for 4000 Hz in accordance with hearing screening guidelines (ASHA, 1993). After removing the headphones, the examiner provided verbal praise such as, "That was fine." She next explained that a measure of "eardrum movement" would be taken. A GSI 28 Auto tympanometer was used for impedance measures. The examiner showed the subject how the probe would be inserted gently into his/her ear so the "machine" could make a tracing, or "picture," of the way his/her eardrum moved. Normal tympanograms revealed middle ear pressure no greater than -200 daPa. None of the subjects objected to either procedure. After completing impedance testing, the examiner thanked the subject for his/her cooperation. Each subject was told that he/she would be seen twice more for additional hearing and language evaluations. The subject was then accompanied back to the classroom.

Session Two

Within two days following the hearing screening, each subject was administered A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986), if aged 5 to 11 years, or A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994), if aged 12 years or older. The examiner explained to each subject that this test evaluated how well one could hear under difficult listening conditions similar to a noisy classroom or cafeteria. The test itself was explained as a task of listening to directions given on a tape recording and then repeating a number of words. The subject was told he/she would hear simple instructions followed by the stimulus items (i.e., words/sentences) for each subtest. The examiner next fitted the headphones on the

subject comfortably and then began testing. Each subject repeated the stimuli orally in response to audiotaped directions as the examiner recorded them on a response form. Because all stimuli were given by audiotape, no verbal reinforcement was given by the examiner. However, if a subject became restless the audiotape was briefly stopped between subtests. During this short break, the examiner offered verbal reinforcement such as, "You're doing a good job." When the test was completed, the examiner thanked the subject for his/her efforts and accompanied him/her back to the classroom.

Session Three

Within seven days following session two, evaluation of each subject was completed with the remaining two instruments. The examiner began by explaining that language skills would be evaluated. This was accomplished with the Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test] (Semel et al., 1989). Only one subject (#16) was younger than eight and thus had to take the first subtest of the CELF-R Screening Test. This subject was told that the examiner would show him some pictures and talk about them. The subject was asked to help the examiner by finishing some of the things she said. Each subject between 8 and 12 years was told he/she would begin by pointing to some pictures in the test manual in response to the examiner's directions. Subjects 13 years or older were told they would begin by repeating every word of a sentence spoken by the examiner. The succeeding subtests were then administered, each beginning with one or two practice items. The examiner offered verbal reinforcement between subtests and made a brief transition to the next task (e.g., "You are

working hard. Next we are going to ...,"). When all subtests were completed, the examiner introduced the final test to the subject by explaining that this instrument offered another way to evaluate hearing ability.

The Lindamood Auditory Conceptualization Test-Revised Edition [LAC] (Lindamood & Lindamood, 1979) was then administered as a measure of phonological awareness. The LAC provides a cue sheet with exact wording to introduce each subtest and to demonstrate each task. For example, after administering the five-item pretest, the examiner began the test with the following:

I want you to use these blocks to show me how many sounds I make, and whether they are the same or different. Let me show you what I mean. If I say /z/ /z/, I made two sounds that are the same. So you would show two blocks that are the same color. Start here (at the left) and go this way (to the right). Let me show you first, then it will be your turn.

The examiner gave two more demonstrations of the task and then began to administer Category I-A and I-B of the LAC. A similar demonstration was given for Category II, with the examiner moving blocks through seven changes in the block pattern to illustrate addition, substitution, omission, shifting, or repetition of phonemes. Administration of Category II began with the instruction, "Show me /I/." When an error was made in Category II, the examiner cleared the blocks the subject had been using and commented "Now it's my turn to set up a pattern." This allowed the examiner to arrange an alternate pattern and provide the subject with the next instruction as directed in the examiner's manual, such as "If that says /Ip/, show me /pI/." After completion of the LAC, the examiner thanked the subject for his/her cooperation throughout the testing sessions and returned him/her to the classroom.

Post Hoc Reading Level Analysis

A post hoc analysis of reading achievement was undertaken after the evaluation of all subjects was completed to determine whether the children who exhibited phonological awareness deficits were reading below their expected grade level. As some of the subjects had been discharged from the program, reading levels were available for 21 of the 32 subjects. Upon admission and annually thereafter, the Woodcock-Johnson Test of Achievement, a portion of the Woodcock-Johnson Psychoeducational Battery-Revised (Woodcock & Johnson, 1991), was administered by the school staff. Therefore, assessment of reading abilities had been made for all subjects within the past year. The Woodcock-Johnson Test of Achievement provides chronological age norms from which expected reading levels can be derived. School records were examined to determine a current reading level for 21 of the original 32 subjects.

Reliability

A determination of intra-judge reliability was made by readministration of the three experimental test instruments to four randomly selected subjects over a two-day period after completion of testing for all 32 subjects. The SCAN or SCAN-A was administered on the first day. The CELF-R Screening Test and the LAC were completed on the second day. Comparisons were made on the basis of a pass/fail score as determined by the scoring instructions for each instrument. The intra-judge reliability coefficients were 1.00 for all tests (i.e., LAC, CELF-R Screening Test, SCAN, and SCAN-A).

Inter-judge reliability was determined by an item-by-item comparison of scores given by the first examiner and a second examiner on five subjects for the SCAN, SCAN-A, CELF-R Screening Test, and LAC. The second examiner, a master's student in speech-language pathology with experience administering the test instruments, sat unobtrusively in the testing room and scored subject responses until all of the experimental instruments had been completed for five subjects. Comparisons were based on the subjects' raw scores on individual test items. Individual inter-judge agreement coefficients were as follows: LAC = 1.00, CELF-R Screening Test = .9657, SCAN = .9792, and SCAN-A = .9644. (See Table 2 for a summary of the total number of agreements versus disagreements for the individual items of each experimental instrument.)

Table 2

Summary of inter-judge agreement coefficients for individual items from the *Lindamood Auditory Conceptualization Test-Revised Edition [LAC]*, the *Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test]*, the *Screening Test for Auditory Processing Disorders [SCAN]*, and the *Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A]*

	<u>LAC</u>	<u>CELF-R Screening Test</u>	<u>SCAN</u>	<u>SCAN-A</u>
Agreements	140	175	529	309
Disagreements	0	6	11	11
Agreement Coefficients	1.0	.9657	.9792	.9644

CHAPTER IV

Results

The subjects' scores from all test instruments were analyzed using the SAS software program. Descriptive statistics, including means, standard deviations, and score ranges were computed for the subjects' scores on all experimental instruments. A pass/fail assignment was made for all test scores, and the frequency (and percentage) of the subjects that passed each of the tests was calculated. Chi square analyses were performed on the data to determine whether significant relationships existed either between age or ADHD/ADD and performances on measures of phonological awareness, language, and/or auditory processing.

Phonological Awareness Deficits

Nearly all of the subjects demonstrated phonological awareness deficits, as measured by performance on the Lindamood Auditory Conceptualization Test-Revised Edition [LAC] (Lindamood & Lindamood, 1979). Thirty-one of the 32 subjects (96.9%) failed the LAC, whereas only one subject passed. The authors of the LAC provide recommended minimum scores (i.e., converted scores based on 100 possible points) for the first and second halves of each grade level from kindergarten to seventh grade, which is considered adult level. Descriptive statistics of the converted scores for the subjects

were: $M = 59.97$ (median = 60.00), $SD = 17.91$, and range = 30 to 94. The weighted mean of the recommended minimum scores for all subjects was 93.2. This weighted mean was based on the following grade distribution of the subjects: 2 subjects (second grade), 3 (third), 3 (fourth), 6 (fifth), 13 (sixth), and 5 (seventh plus). The individual subject's scores on the LAC, as well as on the CELF-R Screening Test and the SCAN or SCAN-A, are given in Appendix H. The subjects' mean scores by grade level are compared to the LAC's recommended minimum scores for the second semester in Table 3.

Although most of the subjects had some difficulty with the items in Category I-A and I-B, their performances indicated greater difficulty with Category II of the LAC. The mean raw score for all subjects on Category I was 13.72 of the 16 points possible (86%), while the mean raw score on Category II was 5.97 of the 12 points possible (50%). As previously described, the items in Category I required the abilities to discriminate the number, sameness or difference, and the sequential order of phonemes in nonsense syllables. In contrast, the items in Category II required the abilities to discriminate, track, and remember phonemic changes in nonsense syllables.

As previously described, a post hoc analysis of reading achievement was undertaken to determine whether the children who exhibited phonological awareness deficits, as measured by the LAC, were reading below their expected grade level. According to their academic records, 16 of the 21 subjects for whom reading levels were available were reading from 0.7 to 4.0 years below grade level. On average, the reading levels of these subjects were about 1.5 years below grade level. However, if expected reading levels were calculated on the basis of chronological age rather than grade, the

Table 3

Comparison of the subjects' mean scores to the recommended minimum scores for the second semester on the *Lindamood Auditory Conceptualization Test-Revised Edition* [LAC]

Grade Level	Subjects' Mean Score	Recommended Minimum Score
Grade 2	40	71
Grade 3	45	81
Grade 4	62	86
Grade 5	54	93
Grades 6 - 9	66	99

reading delays would no doubt be greater. This is due to the fact that a majority of the subjects had been retained one or more academic years (e.g., subject 14, who was 11 years and one month old, was in the third grade).

Language Deficits

A screening of language skills with the Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test] (Semel et al., 1989) revealed that a great majority of the subjects demonstrated probable language deficits. Twenty-nine of the 32 subjects (90.6%) failed the CELF-R Screening Test; the remaining three passed. Age-based criterion scores were used to determine whether a subject passed or failed this screening test. Based on age, different combinations of six subtests were administered as directed by the test manual. Children aged 5 to 7 years were given the first three subtests; those aged 8 through 12 years were given Subtests 2 through 6; and those aged 13 through 16 years were given Subtests 3 through 6. There was only one subject in the first age group. At 7:9 (years:months), this subject achieved a score of 17 (2 points below the criterion score of 19). Descriptive statistics of the criterion scores for subjects in the remaining two age groups were: ages 8 through 12 years, $M = 23.45$ (median = 19.5), $SD = 8.89$, and range = 9 to 42; ages 13 through 16 years, $M = 26.67$ (median = 28), $SD = 6.56$, and range = 17 to 35. The weighted means of the criterion scores for the subjects in each of the two upper age groups were: 1) ages 8 - 12 = 33.63, and 2) ages 13 - 16 = 33.33. Descriptive statistics of the criterion scores for the total

sample group were: $M = 24.16$ (median = 18), $SD = 8.27$, and range = 9 to 42. The weighted mean of the criterion scores for all subjects was 33.09. Examining the subjects' performances on individual subtests of the CELF-R Screening Test revealed that they averaged 58% correct responses on Subtest 2, 52% on Subtest 3, 42% on Subtest 4, 40% on Subtest 5, and only 23% on Subtest 6. Over 90% of the subjects therefore demonstrated substantial deficits in the abilities to follow morphological rules, follow oral directions containing linguistic concepts, recall and imitate sentence structure, recognize associated word categories, interpret semantic relationships within sentences, and formulate sentences.

Auditory Processing Deficits

Auditory processing skills were examined with A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986) for subjects aged 7:9 (years:months) to 11:9 or A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994) for subjects aged 12:0 (years:months) to 15:4. A standard score of 85 ($M = 100$, $SD = 15$) is considered the cut-off score to determine pass/fail for the SCAN and the SCAN-A.

Descriptive statistics of the standard scores for the 11 subjects who took the SCAN were: $M = 87.09$ (median = 81), $SD = 16.72$, and range = 65 to 122. Descriptive statistics for the 21 subjects who took the SCAN-A were: $M = 56.52$ (median = 54), $SD = 15.96$, range = 33 to 92. Taken together, the two groups performed as follows:

M = 67.03 (median = 41), SD = 21.73, and range = 33 to 122. Twenty-six of the 32 subjects thus exhibited auditory processing deficits by achieving standard scores at or below the 16th percentile, or one standard deviation below the mean, on the SCAN or the SCAN-A. This represented 81.3% who evidenced auditory processing problems. In fact, 59% of the subjects scored more than 2 standard deviations below the mean, and 34% of them scored more than 3 standard deviations below the mean. Scores on the SCAN's third subtest differed considerably from scores on Subtests 1 and 2. On average, the subjects responded correctly to 87% of the items on Subtest 1, 81% on Subtest 2, but only 65% on Subtest 3. For the SCAN-A, the subjects responded correctly to 75% of the items on Subtest 1, 87% on Subtest 2, 69% on Subtest 3, and 72% on Subtest 4.

Relationship Between Age and Performance on Measures of Phonological Awareness, Language, and Auditory Processing

Three chi-square analyses were performed to determine whether there was a significant relationship between chronological age and the subjects' performances on measures of phonological awareness, language, and/or auditory processing skills. The analyses compared age and recommended minimum scores, criterion scores, or standard scores, for the LAC, CELF-R Screening Test, and the SCAN or SCAN-A, respectively, with an alpha level set at 0.05. No relationship was determined between age and performance on the LAC, $\chi^2(1, N = 32) = 1.971$, $p = .160$, or the CELF-R Screening Test, $\chi^2(1, N = 32) = 1.734$, $p = .188$. However, a significant relationship between age

and the subjects' performances on the SCAN or SCAN-A was found, $\chi^2(1, N = 32) = 7.846, p = .005$. The significance level was corrected with the Bonferroni method (Bray & Maxwell, 1985), given that there were three assessment procedures. The relationship between chronological age and SCAN or SCAN-A scores remained significant, even with the more stringent alpha of .0167, (.05 divided by 3 = .0167). Table 4 summarizes the expected and observed frequencies of pass/fail scores for the SCAN (Group 1, ages 7:9 to 11:9) and the SCAN-A (Group 2, ages 12:0 to 15:4). Table 5 summarizes the chi-square statistics for the analyses of chronological age, SCAN, and SCAN-A standard scores.

Relationship Between ADHD and Performance on Measures of Phonological Awareness, Language, and Auditory Processing

Three additional chi-square analyses were performed to determine whether there was a relationship among the test performances on the LAC, the CELF-R Screening Test, and the SCAN or SCAN-A by subjects with and without diagnoses of attention deficit hyperactivity disorder [ADHD] or attention deficit disorder [ADD]. A Bonferroni correction was calculated, reducing the alpha level to .0167 (Bray & Maxwell, 1985). No significant relationships were found between ADHD or ADD and the subjects' performances on the LAC, $\chi^2(1, N = 32) = 0.404, p = .525$, the CELF-R Screening Test, $\chi^2(1, N = 32) = 1.295, p = .255$, and the SCAN or SCAN-A, $\chi^2(1, N = 32) = 0.099, p = .753$, as all probability percentages were greater than .0167.

Table 4

Summary of data for chi-square analysis of the relationship between age and performance on A Screening Test for Auditory Processing Disorders and A Test for Auditory Processing Disorders in Adolescents and Adults

	Fail	Pass	Total
Group 1 (Ages 7:9 to 11:9)			
Frequency	6.0000	5.0000	11.0000
Expected	8.9375	2.0625	
Percentage	18.7500	15.6300	34.3800
Group 2 (Ages 12:0 to 15:4)			
Frequency	20.0000	1.0000	21.0000
Expected	17.0630	3.9375	
Percentage	62.5000	3.9375	65.6300
Total Number	26.0000	6.0000	32.0000
Total Percentage	81.2500	18.7500	100.0000

Table 5

Summary of chi-square statistics indicating a significant relationship between age and performance on A Screening Test for Auditory Processing Disorders or A Test for Auditory Processing Disorders in Adolescents and Adults

Statistic	DF	Value	Probability
Chi-Square	1	7.846	0.005
Likelihood Ratio Chi-Square	1	7.686	0.006
Continuity Adjusted Chi-Square	1	5.403	0.020
Mantel-Haenszel Chi-Square	1	7.601	0.006

CHAPTER V

Discussion

Evidence of Phonological Awareness Deficits in School-Aged Children With SED

Thirty-one of the 32 subjects (96.9%), who were certified as SED, demonstrated deficient phonological awareness skills as measured by the Lindamood Auditory Conceptualization Test-Revised Edition [LAC] (Lindamood & Lindamood, 1979). This finding supports the premise put forth in previous research that phonological awareness, as a subskill of auditory processing, is a suspected area of weakness for this population (Blachman, 1991; Cohen et al., 1989; Mack & Warr-Leeper, 1992).

Children with concomitant SED and language disorders appear to be at particular risk for problems with phonological awareness because language disorders frequently include phonological awareness deficits. The subjects in this study demonstrated a 90.6% incidence of concomitant SED and language disorders. School-aged children with SED have been shown through numerous studies to have a high incidence of concomitant language disorders (Baker & Cantwell, 1987a; Beitchman & Brownlie, 1996; Beitchman et al., 1986; Blachman, 1991; Camarata et al., 1988; Cantwell & Baker, 1991; Grinnell et al., 1983; Kotsopoulos & Boodoosingh, 1987; Westman et al., 1987). Thus, the findings of this study are congruent with the body of research which describes the communication

characteristics of school-aged children with SED and further emphasizes that this population appears to be at considerable risk for phonological awareness deficits.

The significance of the risk for phonological awareness problems in children with SED may be evaluated through information provided by the authors of the Lindamood Auditory Conceptualization Test-Revised Edition, one of the few standardized measures of phonological awareness skills available (Lindamood & Lindamood, 1979). Recall that LAC scores are reported as recommended minimum scores for the first and second halves of the academic year. Only one of the subjects, a 10-year-old fourth grader, met the LAC recommended minimum score for the second half of the academic year.

Only four subjects, or 12.5% of the sample in this study, were able to correctly respond to all the items in Category I. The authors of the LAC stated that 80% of children at the end of first grade, between six and seven years old, should be able to correctly code the patterns in Category I. Category 1-A and 1-B contain 16 stimulus patterns requiring the ability to discriminate the number, sameness or difference, and the sequential order of phonemes in two- or three-unit patterns (e.g., the subject placed a red, white, and another red block for the sounds /n, l, n/). Item 8 of Category I-A was frequently missed. This item required that the subject use three differently colored blocks to represent the phonemes /f/, /s/, /θ/. In spite of being directed to observe the examiner's mouth during presentation of this item, many subjects were unable to benefit from the visual cue and represented the first and last sounds in the pattern as the same sound. This indicated an inability to integrate visual and auditory information to perform a phonemic discrimination task.

None of the subjects correctly completed the second subtest, Category II, which contains the more difficult tasks of identifying and tracking changes in 12 items, beginning with a single phoneme and building to a four-phoneme pattern through additions, substitutions, omissions, shifts, or repetitions of phonemes (e.g., the subject placed green, yellow, and red blocks to represent the syllable /vap/ and then added a white block to change the syllable to /vaps/). Many subjects displayed difficulty with the task by producing perseverative responses (e.g., moving the first block to the end of the pattern for each item regardless of the stimulus presented). Although the authors suggested that most individuals can complete the LAC within 10 minutes, many of the subjects required 20 to 25 minutes to complete the test. Such slow responses would indicate these subjects experienced considerable difficulty with the tasks.

For example, subject 22 evidenced frustration over an inability to track changes in the stimuli on the LAC's Category II by pushing angrily away from the table and announcing, "This is really making me mad!" This subject also expressed worry over expected failure by frequently attempting to see the examiner's marks on the response form. An attitude of learned failure was evident in the many subjects who were anxious to know how well they were performing on this experimental instrument.

Eliciting valid, representative test performances was a matter of concern regarding these children. However, only one 11-year-old subject seemed incapable of performing the tasks required by the LAC. He missed the first four items (which are the simplest) of Category 1-A and failed to respond to reminders about the task. It was noted that his hands shook so violently that he had difficulty placing the blocks on the table. Testing

was therefore discontinued and resumed three days later, at which time this subject responded correctly to nine of the 10 items in Category I-A and completed the test without incident. Only this one subject appeared to have temporary problems completing the assessment tasks. Therefore, it can be fairly stated that the test scores achieved by the subjects on the LAC were representative of their phonological awareness abilities.

It should be noted that scoring for the LAC is not calculated on percentiles or average levels of age- or grade-related performance. Based on their research and clinical experience with the LAC, the authors proposed that beyond the first grade there tends to be a bimodal distribution of performances on the test. Rather than achieving an average level of performance on the LAC which improves with age to adult levels, after the second grade subjects tend to perform as two groups--the "haves and the have-nots" (Lindamood & Lindamood, 1979, p. 27). The "haves," who score at or near the top on the LAC, evidently have mastered the phonological awareness skills required for correct performance. However, the authors report that the "have-nots," who score in the lower ranges of the LAC, will not improve their phonological awareness skills without direct intervention. This group without mastery of phonological awareness equals approximately 33% of the general population (Lindamood & Lindamood, 1979, p. 34).

On the basis of their performance on the LAC, the subjects in this study far exceeded the anticipated 33% failure rate. The 96.9% of the subjects who failed to meet the minimum scores suggested for each grade level exhibited deficits of the phonological awareness and/or phonological conceptualization skills measured by the LAC. In view of the association between phonological awareness and early reading success, the

phonological awareness deficits demonstrated by these subjects may well be reflected in poor reading and spelling skills (Lindamood & Lindamood, 1979).

In fact, 76% of the subjects in this study, for whom reading levels were available, were reading 0.7 to 4.0 years below expected grade level. This constituted an average delay of 1.5 years. Only one of the subjects had passed the LAC, and he was reading at grade level. Most of the remaining subjects who were reading at or above grade level had earned near-passing scores on the LAC. This information lends support to the supposition that phonological awareness deficits adversely affect reading abilities. The academic program staff of the facility attended by the subjects utilized age-based norms for subtests from the Woodcock-Johnson Psychoeducational Battery-Revised (Woodcock & Johnson, 1991) to determine the students' reading grade levels. As many of the subjects had been retained one or more years, their chronological age was not consistent with their grade placement. Thus, the average reading delay is perhaps even greater than 1.5 years. Nonetheless, this finding corroborates those of previous studies which reported reading and spelling deficits in this population (Harris et al., 1984; Westman et al., 1987). Findings from past research have shown a strong connection between phonological awareness deficits and decoding disabilities affecting reading and spelling (e.g., Blachman, 1991; Kamhi et al., 1985). It is reasonable to speculate that at least some portion of the problems with reading and spelling identified in children with SED are attributable to phonological awareness deficits. The high incidence of phonological awareness deficits found in this investigation, coupled with the finding of reading delays for 76% of the subjects, indicates that this is an area of significant risk for school-aged children with SED

which poses serious implications for academic achievement. Therefore, phonological awareness skills should be evaluated for children with SED who are at risk for reading problems.

Language Deficits Found in School-Aged Children With SED

Just over 90% of the subjects failed the Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test] (Semel et al., 1989). The finding of language deficits in 90.6% of the subjects supports previously published reports that school-aged children with SED exhibit language problems to a marked degree. As noted earlier, a considerable body of research exists which has shown a high co-occurrence of language disorders and SED. For example, in a study which targeted this population, Camarata et al. (1988) described language disorders in 71% of the children. Mack and Warr-Leeper (1992) found that 80% of their subjects with SED exhibited clinically significant speech and/or language impairments, and 82% of the subjects with SED studied by Rudy et al. (1994, September 26) demonstrated language deficits.

As previously explained, the subjects in the current study were evaluated with the Clinical Evaluation of Language Fundamentals -Revised Screening Test [CELF-R Screening Test] (Semel et al., 1989) because this screening instrument allowed efficient evaluation of subjects with limited attentional abilities. Based on the fact that the CELF-R and the CELF-R Screening Test are highly correlated, the finding of a high rate of

concomitant SED and language deficits in this sample group appears to replicate the results of Rudy et al., who reported that 82% of their subjects had language deficits when examined with the CELF-R (1994, September 26). Further, this finding upholds the hypothesis that language disorders are a significant aspect of the profile presented by children with SED.

The 29 (of 32) subjects who failed the CELF-R Screening Test demonstrated difficulty with the test items through their extremely slow responses. This test is untimed but the authors suggested that it should be completed within 10 minutes. As with the LAC, the subjects required considerable time (15 to 40 minutes) to complete the CELF-R Screening Test. Again, the subjects were often very anxious about their performances and persisted in their attempts to respond to the stimuli. This behavior was particularly evident on Subtest 6, which required the ability to formulate sentences from scrambled words. The sentence structures contained direct and indirect objects, coordinated clauses, negation, subordinated clauses, and relativization. The words were presented visually on a page from the stimulus manual and auditorily as the examiner read them aloud. The subject must formulate two different sentences from each group of scrambled words (e.g., "big," "the house," "is" became "The house is big." and "Is the house big?"). The 31 subjects who took Subtest 6 (subject 16 took only Subtests 1 through 3) expended considerable effort on this task but averaged only 1.8 correct responses out of a possible eight. As previously described, the subjects performed most poorly on the more complex syntactic task of sentence formulation presented by the CELF-R Screening Test, but they

also showed serious deficits in skills involving morphology, linguistic concepts, and semantics.

Many of these areas of weakness have been noted in children with SED by other researchers. For example, deficits in formulation and comprehension of complex sentences and higher level vocabulary have been reported (Hummel & Prizant, 1993). Auditory memory, temporal vocabulary, word retrieval, syntax, and narration are additional areas of language deficits previously found in children with SED (Audet & Ripich, 1994). Problems with auditory memory, naming, and word retrieval may also be attributable to weaknesses in the final area of investigation, auditory processing skills.

Children With SED Exhibit Auditory Processing Deficits

Twenty-six of the 32 subjects (81.3%) exhibited auditory processing deficits by their performances on A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986) or A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994). Finding that over 80% of the subjects demonstrated auditory processing weaknesses corroborated results reported from previous research in this area (Baker & Cantwell, 1982; Gualtieri et al., 1983; Katz & Harrison, 1988; Zinkus & Gottlieb, 1979, 1983). Additionally, this finding replicates that of Rudy et al. (1994, September 26), who reported auditory processing deficits as measured by the SCAN for 85% of their subjects, and supports their observations that auditory processing deficits,

along with phonological awareness and language problems, are significant characteristics of school-aged children with SED.

Regardless of the approach the subjects took with the auditory processing tasks included on the SCAN or SCAN-A, the majority of them demonstrated a lack of the skills necessary to succeed. Most of the subjects performed better on the first two subtests than on the last, which contained more complicated tasks requiring high level processing. As with their performances on measures of phonological awareness and language, the subjects' testing behaviors with the SCAN or SCAN-A indicated frustration and difficulty performing the tasks. Because the stimuli for these instruments are presented through headphones from an audio recorder, testing time is limited to about 20 minutes. However, subjects frequently needed additional time to process and imitate the stimuli, particularly on Subtests 3 and 4 which included competing words and sentences, respectively. Their difficulty was evident when the subjects missed items because they were still attempting to respond to the previous item. Others expressed their frustration by taking off the headphones to withdraw from the task. Only once was it necessary to take a break between subtests, as the author suggested for restless subjects (Keith, 1994, p. 11). Subject 3, whose standard score on the SCAN-A was 50 ($M = 100$, $SD = 15$), became extremely irritable and refused to put the headphones back on after Subtest 3. After a short break, however, the subject completed the last subtest willingly. Other subjects demonstrated their difficulty with this test by displaying intense concentration, as did Subject 6 who also scored a 50 on the SCAN-A. Another subject rocked his body from side to side with each stimulus word, evidently to help maintain focus. Several subjects

raised their voices considerably when imitating the stimuli from Subtest 2, which are given against a background of speech babble. This may have been a response to the difficulty of separating the stimuli from the background noise.

Examination of their performances on the subtests reveals that the most difficult tasks for these subjects were those involving discrimination of competing signals presented simultaneously, one to each ear. These are dichotic speech tasks which the author stated "reflect the development of the auditory system, auditory maturation, and hemispheric specialization" for the processing of auditory information (Keith, 1994, p. 3). Poor performance on the more complex dichotic speech tasks of the SCAN and SCAN-A, as with poor performance on tasks of tracking phonemic changes of increasing complexity in nonsense syllables on the LAC, appear to be similar manifestations of deficits common to children with SED. Researchers have suggested these children encounter problems with tasks of auditory discrimination, word retrieval, vocabulary, and syntax when length or complexity is increased (Audet & Ripich, 1994; Hummel & Prizant, 1993; Katz, Stecker, & Masters, 1994, March). Keith's (1994) suggestion that developmental delay or deficit of higher level auditory processing functions underlies these problems seems to have merit. The term "delay" might be construed to indicate that maturation and improved auditory processing skills will come with age. This possibility was examined through analyses of the subjects' ages and their performances on measures of phonological awareness, language, and auditory processing skills. The findings from those analyses are discussed next.

Evidence Regarding Relationships Between Chronological Age and Measures of Phonological Awareness, Language, and Auditory Processing Skills

This investigation found no relationship between chronological age and the phonological awareness skills measured by the LAC or the language skills tested by the CELF-R Screening Test. However, an unexpected significant relationship was shown between age and the auditory processing skills evaluated by the SCAN or SCAN-A. Language skills and auditory abilities are considered to improve with age. Normal hearing, as measured by pure tone thresholds, speech intelligibility scores, and discrimination of intensity differences, reaches maximum maturation between the ages of 10 and 13 years (Sloan, 1991). However, as previously mentioned, some researchers have postulated that abilities to make phonemic discrimination within syllables are intact by the age of 7 or 8, or by the second grade (e.g., Lindamood & Lindamood, 1979). Lindamood and Lindamood further stated that an individual without these phonological awareness skills in place by the second grade would not acquire them without intervention. As all of the subjects were in the second grade or above and should have mastered the phonological awareness abilities required by the LAC, it was hypothesized that no relationships would be found.

A chi-square analysis did, in fact, fail to find any significant relationship between chronological age and phonological awareness skills, as measured by the LAC. Similarly, no relationship was found between chronological age and the language abilities examined by the CELF-R Screening Test. In contrast, a significant relationship was found between

chronological age and the auditory processing abilities evaluated by the SCAN or the SCAN-A. As stated previously, these instruments assessed the abilities to discriminate and comprehend a degraded speech signal, a speech signal with competing speech-babble background noise, and competing speech signals at the word and sentence levels.

The unexpected finding of a significant relationship between age and performance on a measure of auditory processing was likely due to the age distribution of the subjects and the tests of auditory processing they were required to take (i.e., SCAN or SCAN-A). The SCAN evaluates individuals aged 3:0 to 11:11 (years:months); whereas, the SCAN-A, with increased task difficulty, tests individuals aged 12 years to adulthood. Therefore, the 12 subjects who were only a few months beyond the upper age limit for the SCAN were required to take the more difficult adult version, the SCAN-A. Nearly 65% of the subjects fell just below or above the cut-off age for the two versions. With age more evenly distributed within the sample, it is very possible that no significant relationship would appear between age and the auditory processing skills measured by these instruments. An investigation to test the significance of this relationship would require a larger sample size with equal numbers of subjects across age levels. If a significant correlation was determined by such a study, it would indicate that maturation does, in fact, influence acquisition of the auditory processing skills measured by the SCAN or SCAN-A.

**No Relationship Found Between Attention Deficit Hyperactivity Disorder or
Attention Deficit Disorder and Performance on Measures of Phonological
Awareness, Language, and Auditory Processing Skills**

No relationship was determined between attention deficit hyperactivity disorder [ADHD] or attention deficit disorder [ADD] and performances on the above-mentioned tests of phonological awareness, language, and auditory processing. One subject in this study was diagnosed with attention deficit disorder [ADD], predominantly inattentive type, while 22 had attention deficit hyperactivity disorder [ADHD] among their psychiatric diagnoses. Thus, 71.9% of the sample had ADD or ADHD, making these diagnoses the most commonly found. This finding is consistent with previous research which revealed that undifferentiated attention deficit disorder was the most frequently occurring behavioral disorder in children with SED (Baker & Cantwell, 1982; Beitchman et al., 1986; Westby & Cutler, 1994; Westman et al., 1987).

Although all of the subjects diagnosed with ADD or ADHD were on psychotherapeutic medications to reduce distractibility, there was concern that attentional problems might affect test performance. The measures of phonological awareness and auditory processing skills, in particular, required focused attention to successfully perform the tasks (Katz et al., 1992; Pinheiro & Musiek, 1985; Sloan, 1991). Therefore, three chi-square analyses were performed to identify any correlation between ADD or ADHD and scores on the LAC, CELF-R Screening Test, and the SCAN or SCAN-A. These analyses failed to find any such relationships. The pattern of performance on these measures of

phonological awareness, language, and auditory processing skills was unaffected by the presence of ADHD/ADD for the subjects of this study. However, because of the small number of subjects without ADHD/ADD (only nine), the results should be interpreted with caution. An investigation with larger and more equal numbers of subjects with and without ADHD/ADD is needed to determine whether these disorders influence performance on phonological awareness, language, or auditory processing tasks. However, the present results suggest that children with ADHD/ADD who are properly medicated can give valid measures of their phonological awareness, language, and auditory processing skills.

SED may Mask Language Disorders

Results of this investigation show that deficits in phonological awareness, language, and auditory processing abilities were significant components of the profiles exhibited by 75% of the school-aged children with SED who participated in this study. Yet none of the subjects in this study was receiving speech-language treatment at the time of assessment, in spite of the fact that 96.9% evidenced phonological awareness deficits, 90.6% demonstrated receptive and expressive language problems, and 81.3% exhibited auditory processing deficits. The three subjects who had received speech-language services previously in the public schools had been treated for articulation errors only. This finding corroborates research which indicated that the communication problems of school-aged children with SED are often overlooked. For example, Camarata et al. (1988) noted

that, while 71% of their subjects demonstrated language deficits, less than 6% of them had received language intervention. It is likely that management is often focused on the serious, and more obvious, consequences of psychiatric illness in young children. Because the effects of language disorders in children with SED are also serious and far reaching, it is equally vital to identify and treat their communication deficits.

The effects of language and phonological awareness deficits on academic achievement, as reflected by the subjects' delayed reading scores, are underscored through an examination of their academic curriculum. Although the subjects were not receiving speech-language intervention at the time of this study, they were receiving academic remediation in addition to psychiatric treatment. The school curriculum was adapted to the needs of individual students. Reading skills, in particular, were addressed in a variety of ways by the teaching staff, depending on the chronological age and academic status of the students. An approach combining whole language with phonics was used in the subjects' school (e.g., basal readers were used within a theme-based curriculum). Younger students participated in a classroom reading time and activities such as DEAR [drop everything and read]. Older students received a remedial approach, often with an emphasis on life skills and reading of "survival words" (e.g., exit, bathroom). The only literature-based activities were book reports. A teacher-directed method was used, but with an emphasis on teacher-to-student rather than teacher-to-group. In spite of these attempts to individualize reading instruction to the students' needs, a majority of the subjects for whom reading levels were obtainable (76%) were still reading well below their expected grade level.

Clinical Implications

Effects of Phonological Awareness Deficits

Although the whole language approach has proven effective for the majority of primary school students, there is a percentage who cannot learn from this method alone (Naremore, Densmore, & Harman, 1995). These are the children who need direct phonological awareness intervention along with a print-rich environment and the literacy activities of a whole language approach (Blachman, 1991). Research has shown that intact phonological awareness skills result in automaticity which facilitates decoding in early readers (Swank, 1994, p. 67). The child without automatic phonological coding/decoding skills works harder, experiences more frustration, ultimately reads less with less comprehension, and falls further behind the successful decoders in reading abilities (Swank, 1994).

For children with phonological awareness deficits, a number of standardized intervention programs are available (Lindamood & Lindamood, 1975; Sloan, 1991). These programs directly teach the skills of discrimination, segmentation, and blending with an emphasis on learning to use visual and tactile cues to augment auditory information. For example, Elkonin (1973) suggested use of a line drawing of a familiar object with boxes below it corresponding to the number of phonemes in the pictured word. As the child pronounces the word, he/she places a disk or counter in each box. The picture relates visual to auditory information and reduces the task of keeping the word in auditory short-term memory while it is being segmented. The Auditory Discrimination in Depth

Program (Lindamood & Lindamood, 1975) teaches integration of auditory, visual, and tactile information by descriptively labeling sounds (e.g., lip poppers = labial stops such as /b/, tip tappers = alveolar stops such as /d/).

Outcome studies for children with SED who have received phonological awareness instruction are not yet available. However, a study involving 63 learning disabled subjects, aged 7 to 12, illustrated the benefits of remediating phonemic deficits in special populations of children (Williams, 1980). For two consecutive years the 63 experimental subjects and 64 controls were tested on skills of auditory analysis, syllable and phoneme blending, letter-sound correspondence, and decoding. Pretests were given at the start of both academic years, and the same tests were administered as posttests at the end of each year. Teachers for both the experimental and control groups were selected on the basis of recommendations for competency. The researcher supplied a 12-unit program to teach the four skills covered by the pre-/posttest. Teachers with experimental subjects in their classrooms used this program twenty minutes daily to supplement their reading instruction until all 12 units were completed. Teachers of the control subjects did not use the experimental instruction program. Basal-reading programs were used by all teachers, with 75% also using phonics materials. Results revealed that the experimental subjects achieved significantly higher scores than the controls on every subtest of the posttest except one (i.e., identifying initial phonemes). Because the children who received the program performed significantly better than the children who served as controls on novel and nonsense words as well as familiar

and real words, they appeared to have acquired generalized decoding strategies as a result of their instruction in phonological awareness skills (Williams, 1980).

An efficacy study of the Auditory Discrimination in Depth Program [ADD] (Lindamood & Lindamood, 1975) also shows the value of phonological awareness intervention (Alexander, Andersen, & Heilman, 1991). The ADD program was used with 10 dyslexic children over an average of 64 one-hour sessions. Pre- and posttests were administered assessing phonological awareness and reading skills using the LAC and the Word Identification and Word Attack Subtests of the Woodcock Reading Mastery Tests (Woodcock, 1973). Pretest scores on the LAC ranged from 31 to 88 but improved to 100 for all subjects except one, who achieved a 99, on the posttest. Group means improved from 75.1 to 87.6 on the Word Identification Subtest and from 77.7 to 98.4 on the Word Attack Subtest of the Woodcock Reading Mastery Tests. These results indicated that instruction with the ADD program proved effective in increasing the phonological awareness skills assessed by the LAC as well as the reading skills evaluated by these subtests of the Woodcock Reading Mastery Tests.

Direct instruction in phonological awareness, whether provided through an organized program or informally presented with tasks tailored to student needs, can augment whole language instruction and contribute to success in literacy for children with phonological awareness deficits. Because literacy skills are essential to success in nearly all academic areas, a lack of adequate phonological awareness skills may have widespread effects on academic achievement. It is imperative, therefore, that children identified as

seriously emotionally disturbed [SED] receive early screening for communication skills, including phonological awareness abilities.

Impact of Language Deficits

For children with SED who exhibit language deficits, there are additional considerations. The main focus of psychiatric treatment for children with SED is therapeutic counseling and pharmacologic management. However, many psychiatric assessment instruments and treatment procedures are heavily language oriented. Psychiatric evaluation, diagnosis, treatment planning, and prognosis may be significantly influenced by a child's undetected language deficits (Love & Thompson, 1988). The child without an adequate affective vocabulary will find it difficult to both understand the counseling process and to express his/her feelings and thoughts to the counselor.

Treatment for children with SED thus often targets vocabulary, especially the language of feelings. Language therapy might include describing the emotional reactions of others, as well as those of the child, and providing labels for those emotions (Giddan, Trautman, & Hurst, 1988). A notebook of feeling words can be compiled with meanings derived from activities such as story reading and role playing (Giddan, 1991). Modeling appropriate emotional reactions with vocal inflections, facial expressions, and body language has been recommended (Giddan et al., 1995). These authors also suggested activities which identify the reason for specific reactions and teach coping strategies (e.g., counting to ten before speaking or stopping to think whether the reaction is a good choice). Alternatives to displaying anger might include running around the school gym until the child feels

calmer. An older child might keep a journal of his/her feelings and the circumstances that triggered them. The teacher or speech-language pathologist may then read the entries and write an identification of the child's feelings (Giddan et al., 1995).

It may also be necessary to teach the language of the classroom, directly teaching a child the meaning of verbal and nonverbal cues and to recognize and follow common classroom routines (Naremore et al., 1995). Pragmatic skills such as initiating play or conversation, getting attention, and settling disputes can be taught to improve peer relationships (Giddan, 1991). An important goal of language intervention targets replacement of uncontrolled behaviors with words to reduce the conflict, anger, and turmoil children with SED often experience (Giddan et al., 1995). Other language goals often include temporal awareness (e.g., clauses as "before she left..."), organizational skills (e.g., listing recipe steps), and self-regulation (e.g., calming self-talk) (Audet & Hummel, 1990; Hummel & Prizant, 1993).

The interrelation between language and socioemotional behavior has been recognized by early leaders in the field of speech-language pathology. Socioemotional behavior includes the abilities to express and regulate emotional states, establish positive relationships, and develop a sense of self. Language skills underlie these abilities as developmental research has shown that language serves two primary functions for a child: (1) regulation of others' behavior and (2) regulation of one's own behavior (Prizant & Wetherby, 1990). Language impairment very early in life affects a child's ability to regulate others' behavior because of difficulty initiating messages and responding verbally to the caregiver. This influences the quality and often the quantity of child/caregiver

interactions as well as limits the child's ability to regulate the people and environment around him/her. With age, untreated language deficits compound socioemotional problems for children with SED. Discourse problems extend beyond family interactions to peers and later to classroom teachers. Specific deficits which have been identified in school-aged children with co-occurring language deficits and SED include poor pragmatic skills. These children fail to follow discourse rules such as turn taking, referencing, and topic maintenance (Hummel & Prizant, 1993). Children without functional semantic and syntactic skills (e.g., use of negatives, requests for clarification) often rely on inappropriate behavior to communicate their intent (e.g., throwing a text book on the floor when the assignment is not clear). Frequent communication breakdowns occur for children without adequate discourse skills, contributing to a cycle of tension and frustration for the child and the listener. Such breakdowns, again, negatively influence relationships with family and peers as well as impede academic progress in school (Hummel & Prizant, 1993).

Further, language impairment affects the child's ability to form concepts from his/her experiences, to reflect, solve problems, anticipate, and plan for future events. Children with SED and language deficits have evidenced poor abilities to solve problems, learn from previous experience, or anticipate and plan for future events (Prizant & Wetherby, 1990). Deficits in these areas also contribute to difficulties with family and peer interactions for children with SED and hinder regulation of their own behaviors. Language deficits which lead to academic failure and impaired relationships also damage the child's self image. Low self-esteem is a hallmark of children with SED (Zinkus & Gottlieb, 1983). Diminished self-confidence and self-concept no doubt contribute to the

problematic behavior associated with emotional or behavioral disorders. The interrelationships between language and socioemotional development have led some investigators to theorize that early language deficits may cause emotional disturbance (Prizant et al., 1990). Whether or not the relationship is causal is currently unknown; however, language impairment clearly contributes to and maintains psychosocial problems for the young child (Prizant et al., 1990). These observations illustrate the importance of early screening for language deficits in children with SED and the need for family-based, multidisciplinary intervention.

Research has indicated that psychiatric disorders in children are transactional with influences from a multitude of factors such as neurological impairment, parental abuse or neglect, academic stress and failure, and inadequate peer relationships. Therefore, assessment and treatment must be multidisciplinary involving the child's parents, physician, psychologist, psychiatrist, social worker, classroom teacher, special education teacher, audiologist, speech-language pathologist, and other professionals as needed (Giddan, Bade, Rickenberg, & Ryley, 1995; Prizant & Meyer, 1993).

Little information has been published regarding the efficacy of language intervention for children with SED. A three-year follow-up study of 14 boys with receptive language deficits showed improvements in communication skills in 50% of the subjects (Cantwell, Baker, & Rutter, 1989). However, the authors noted an increase in difficulties with peer relationships for some subjects even though language skills were improved. This finding seems to counter the theory that socioemotional problems may be caused by the social stresses associated with language disorders. A five-year follow-up

study of children with concomitant speech-language and psychiatric disorders found indirect evidence regarding speech-language skills (Baker & Cantwell, 1987b).

Psychiatric disorders increased from 44% of the sample initially to 60% five years later. Analyses of the data revealed a trend toward an association between lack of improvement in language skills with the development of a psychiatric disorder. These two studies seem to indicate that language intervention is effective in reducing language deficits for some children with SED, but they offer conflicting information regarding the relationship between SED and language disorders.

One additional follow-up study offered intriguing information regarding the relationship between language disorders and SED. Not surprisingly, the investigation found that five-year-old children with language impairments had higher rates of SED seven years later than peers without language impairment (Beitchman, Brownlie, & Inglis, in press). However, it was also found that the children whose language skills had improved at follow-up demonstrated rates of SED comparable to those of children whose language disorders remained. This finding emphasized the pervasive and far reaching influence of early language deficits associated with SED. A second notable finding revealed that language impairments were associated with psychiatric problems which changed over time. At age five the children with language impairment [LI] were more likely to be diagnosed with ADHD and emotional disorders than were children in the control group. A follow-up study completed when the children were age 12 showed the LI group still demonstrated significantly more emotional disorders than the control group, but there was no longer a significant difference between the two groups in prevalence of

ADHD. Certainly many more outcome studies are needed to determine the best approaches to language remediation in children with SED and to verify their efficacy. Such studies would help to determine the influence of language disorders on the development and progress of psychiatric disorders and to clarify the relationship between the two.

Auditory Processing Issues

The final area of deficit revealed in this study is in auditory processing. Specific areas of weaknesses attributed to poor auditory processing skills often overlap with areas affected by language and phonological awareness deficits. For example, researchers identified written and oral discourse skills, inferencing from world knowledge, problem solving, critical thinking, abstract vocabulary, figurative language, metalinguistic functions, word finding, referencing, morphology, and higher level syntax as vulnerable areas for children with auditory processing deficits (Katz et al., 1994). School-aged children with SED who experience problems with auditory processing are at risk for difficulty in the classroom. Much of the information presented in the classroom is delivered auditorily. Children must attend to this information, remember it, and associate it with graphic materials on the board or in texts. Children who are unable to fully benefit from information presented auditorily are at a significant disadvantage.

Treatment takes the form of compensational techniques in three areas: (1) enhancement of the acoustic signal, (2) improvement of the listening environment, and (3) teaching the child listening strategies (Catts et al., 1994, March). The first treatment

requires the services of an audiologist. The speech-language pathologist who suspects an auditory processing disorder refers the child to an audiologist for a complete evaluation and diagnosis. The audiologist frequently fits an FM trainer for the child to boost the intensity of the signal and eliminate background noise and reverberation effects. Research has verified the benefits of FM systems for children with auditory processing deficits. Children taught in a classroom with FM soundfield amplification improved in reading achievement in one study, while another group utilizing FM technology made general academic gains (Ray, Sarff, & Glassford, 1984; Stach, Loiselle, Jerger, Mintz, & Taylor, 1987).

The attending behaviors of 36 subjects described as learning disabled were evaluated in a study investigating the efficacy of FM auditory trainers (Blake, Field, Foster, Platt, & Wertz, 1991). Four behaviors were measured during 15 minute observation periods before and after the experimental group of 18 were fitted with FM units. These behaviors included: (1) body turned towards the speaker, (2) eyes turned towards the speaker, (3) no extraneous body movements, and (4) no extraneous vocal or verbal behaviors. After a 20-week instructional period, the experimental subjects achieved significantly higher scores than the control subjects on all four attending behaviors, with the most significant change occurring in improved eye contact. Although these studies did not target children with SED, they did establish that FM auditory trainers have proven effective compensatory tools for improving auditory attending and processing skills.

As the second compensatory strategy mentioned above, modifications can be made to improve the listening environment for those students with an identified auditory

processing deficit. Classroom teachers frequently use preferential seating, provide redundancy through repetition and restatement of verbal material, reduce distractions, use additional visual aids and cues, use simple and short directions, have the child restate directions to verify understanding, assign a classroom buddy, and/or provide supplementary written information for the benefit of these children (Ferre, 1987).

Finally, the child can be taught to improve listening skills in numerous ways. Ferre (1987) suggested drillwork and games targeting skills of localization, auditory discrimination, sound awareness, sound blending, sequential memory, short-term auditory memory, selective attention, vocabulary, and comprehension (p. 79). Techniques such as chunking; making notes; using context, body language, or facial expressions to supplement auditory information, and monitoring one's level of concentration and comprehension can be taught. Learning to ask speakers to slow down, pause more, and repeat if necessary are additional compensatory techniques. In addition, improving what the child can bring to the listening task will be helpful. Increased world knowledge and improved phonological awareness, syntactic, and semantic skills will enable the listener to fill in gaps or predict auditory information (Catts et al., 1994).

Methodological Issues

Much remains to be learned regarding the interrelationships among SED and deficits in phonological awareness, language, and auditory processing in school-aged children. Whether the relationships are causal or facilitative and maintaining is unknown

and awaits further research. This study has shown that such deficits do exist to an extent beyond what is expected in the general population. However, two limitations of the investigation affected the statistical analyses and generalization of the findings: (1) no control group and (2) small sample size.

No control group was used in this study because specific comparisons to the general population of school-aged children is not possible. This is due to the fact that children with SED, as with nearly all of the subjects in this study, frequently suffer from prenatal exposure to drugs or alcohol, perinatal problems, neurological damage, physical or sexual abuse, neglect, and/or dysfunctional family lives (Prizant & Meyer, 1993). Many have been removed from their families and placed in foster or group homes. Most have been placed in psychiatric units of various public or private programs during crisis periods. Nearly all these children, including those in this study, have a combination of medical, developmental, and psychiatric diagnoses and are treated with a combination of pharmacological and therapeutic interventions. These factors preclude matching children with SED with a control group drawn from any other population. At best, psychiatrically disordered children can only be compared with other similarly disordered children. As the body of research with this special population of children grows, more will be learned about the etiology, mitigating factors, and management of their various deficits.

This investigation involved a small sample due to the difficulty encountered in gaining access to members of this population. Research with any subjects must be stringently controlled to protect their interests. This is particularly so with young subjects who are psychiatrically disordered. Receiving permission to work with a group of 32

children with SED was providential. However, the relatively small sample size with unbalanced age and gender groups further limited statistical analyses for this study. Future research with larger samples can be counterbalanced for factors such as gender, age, or diagnoses to investigate more definitively whether these factors influence performances on measures of phonological awareness, language, and auditory processing.

Future Research

As mentioned above, future research is warranted with equal numbers of subjects in all conditions under study to allow for comparisons between performances of phonological awareness, language, and auditory processing tasks by males versus females, age group versus age group, or subjects with ADHD/ADD versus subjects without ADHD/ADD. Such an investigation would require a larger sample size than was available for the current study.

An important question remaining unanswered is whether children with mild or moderate emotional disturbances are also at risk for deficits in phonological awareness and/or auditory processing skills. The single study known by the author to have investigated children with mild-to-moderate emotional disturbances addressed only general language abilities (Camarata et al., 1988). The children in the present investigation had severe psychiatric disorders, as indicated by their certification with SED. Further research with children who exhibit the full range of psychiatric disorders (i.e., mild-moderate-

severe) is needed to determine the true extent of risk for co-occurring emotional disturbance and communication impairment.

The communication assessment protocol utilized in this study consisted of two screening instruments, the CELF-R Screening Test and the SCAN or SCAN-A, as well as the LAC. Complete follow-up evaluations could not be performed due to time constraints and logistic difficulties. A diagnosis of central auditory processing disorder [CAPD], for example, requires administration of several tests in a sound-treated audiometric booth by a certified audiologist. The SCAN, and occasionally the LAC, may be included in the CAPD assessment battery. Although the SCAN or SCAN-A cannot be used alone to diagnose CAPD, both are sensitive to auditory processing deficits (Keith, 1986, 1994). A follow-up study providing complete audiological evaluations of subjects identified with deficits through screening with the SCAN or SCAN-A would verify the number of false-positives or false-negatives. This information is important, not only for the management of auditory processing disorders in children with SED, but also to determine the efficacy of auditory processing assessment by speech-language pathologists with instruments such as the SCAN and SCAN-A.

Similarly, a future study evaluating the reading and spelling skills of children with SED identified with phonological awareness deficits by the LAC would reveal important information regarding the relationship between literacy and impaired phonological awareness skills. Measures of reading, writing, and spelling skills, such as the Wide Range Achievement Test (Jastak & Jastak, 1965) and the Woodcock Reading Mastery Tests-Revised (Woodcock, 1987), would help determine the effects of phonological awareness

deficits and the benefits of remediation of those weaknesses on classroom performance and academic achievement.

A vitally important area for future research is the efficacy of treatment programs for children with SED and communication deficits. Research projects reporting on intervention programs and remediation outcomes for disorders of phonological awareness, language, and auditory processing in children with SED is warranted. As several disciplines are involved in management of these children, corroborative research uniting the fields of psychiatry, psychology, social science, special education, audiology, and speech-language pathology would bring varied knowledge bases and experiences to bear on determining the best treatment procedures for children with concomitant psychiatric and communicative disorders.

Summary

This study was designed to determine the incidence of phonological awareness deficits in children aged 7:9 (years:months) to 15:4 who have serious emotional disturbance [SED]. The results indicated that a great majority, 96.9%, exhibited phonological awareness deficits as measured by the Lindamood Auditory Conceptualization Test-Revised Edition (Lindamood & Lindamood, 1979). The high incidence of phonological awareness deficits contrasts starkly with the 33% failure rate which can be expected in the general population (Lindamood & Lindamood, 1979). Because of the strong association between phonological awareness and early reading

skills, a post hoc analysis of the subjects' reading achievement was done. The results indicated that 76% of the subjects for whom reading levels were obtained were reading an average of 1.5 years below grade level. This finding highlights the importance of evaluating the phonological awareness skills of children with SED who are at risk for reading impairments.

A secondary purpose was to determine whether the results would replicate the findings of Rudy et al. (1994, September 26) of a high incidence of both language disorders and auditory processing problems in the SED population. Comparable incidence figures were obtained for these disorders in the current study. Language deficits were demonstrated by 90.6% of the subjects as measured by the Clinical Evaluation of Language Fundamentals-Revised Screening Test (Semel et al., 1989). Task analyses found that syntactic activities such as sentence formulation were the most difficult for the subjects, particularly at levels of increased length and complexity. Evaluation with A Screening Test for Auditory Processing Disorders (Keith, 1986) or A Test for Auditory Processing Disorders in Adolescents and Adults (Keith, 1994) revealed that 81.3% of the subjects exhibited auditory processing deficits. The subjects performed most poorly on complex dichotic speech tasks, again demonstrating a breakdown in skills with tasks requiring higher level executive functions. These findings indicate that deficits in phonological awareness, language, and auditory processing skills are significant characteristics commonly exhibited by school-aged children with SED.

Finally, the evidence gathered through this investigation was examined to determine whether significant relationships exist between age and performance on

measures of phonological awareness, language, and auditory processing skills or between the presence of attention deficit hyperactivity disorder [ADHD] or attention deficit disorder [ADD] and these same measures. No relationship was identified between age and scores on the LAC or the CELF-R Screening Test. Although a significant relationship was found between age and scores on the SCAN and SCAN-A, it is likely that the unusual grouping of subjects around the cut-off age between these test versions accounts for that finding. No relationship was found between ADHD or ADD and the subjects' performances on any of the assessment instruments. However, ADHD/ADD was the most common psychiatric diagnosis for the subjects of this study, verifying similar findings published previously (Baker & Cantwell, 1982; Beitchman et al., 1986; Westby & Cutler, 1994; Westman et al., 1987).

Clinical implications drawn from these findings include the need for early screening of phonological awareness, language, and auditory processing abilities in children diagnosed with emotional or behavioral disorders, particularly since the communication problems of these children are so often eclipsed by the symptoms of their psychiatric illnesses. Deficits in these areas of communication produce serious detrimental effects academically and socially, affecting relationships among peers and within families. They adversely affect the child's self image, may exacerbate the psychiatric illness, and hinder his/her ability to understand and participate in therapeutic counseling. Although numerous studies have documented the strong association between SED and language impairment, very little information has been published regarding effective assessment and treatment approaches for this special population. Integrated, multidisciplinary treatment for children

with SED and communication problems will require collaboration among a team consisting of the child's parents, speech-language pathologist, psychologist, psychiatrist, physician, social worker, audiologist, special education and classroom teachers, and other professionals as needed.

In the future, research from all of these professional fields will contribute to a clearer understanding of the relationship between SED and communication deficits. Efficacy of treatment programs targeting phonological awareness, language, and auditory processing deficits in school-aged children with SED must be established to ensure appropriate management of children with concomitant SED and communication disorders.

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APPENDICES

APPENDIX A

Appendix A

Description of Subjects

Subject No.	Gender	IQ	Age	Grade	ADHD/ADD
01	M	85	12:4	6	Y
02	M	89	11:5	6	Y
03	M	76	12:8	6	Y
04	M	80	11:8	5	N
05	M	74	12:6	5	Y
06	M	89	12:10	6	Y
07	M	83	12:4	6	Y
08	M	86	12:10	6	Y
09	M	71	12:4	6	Y
10	M	93	10:4	4	Y
11	M	93	12:2	6	N
12	M	95	11:9	5	Y
13	M	87	12:0	5	Y
14	M	81	11:1	3	Y
15	M	78	12:0	4	Y
16	M	99	7:9	2	N
17	M	92	8:10	3	Y
18	M	96	14:6	9	N
19	M	96	12:4	6	Y
20	M	82	14:10	8	N
21	M	82	13:0	6	N
22	F	84	15:1	9	Y
23	M	99	15:4	9	Y
24	M	89	11:3	5	Y
25	M	90	9:0	2	Y
26	M	88	8:8	3	Y
27	M	82	13:5	6	N
28	M	117	10:2	4	Y
29	M	73	13:4	6	N
30	M	85	13:6	6	N
31	M	83	14:1	8	Y
32	M	74	12:11	5	Y

Note. Age is given as year:months. ADHD/ADD = attention deficit (hyperactivity) disorder.

APPENDIX B

Appendix B

Psychiatric Diagnoses of the Subjects

Listed by Codes from the

Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition [DSM-IV]

(American Psychiatric Association, 1994).

<u>Code No.</u>	<u>Disorder</u>	<u>Subject No.</u>
312.80	Conduct Disorder	01
314.90	Attention Deficit Hyperactivity Disorder, NOS	01
309.81	Posttraumatic Stress Disorder	02
314.90	Attention Deficit Hyperactivity Disorder, NOS	02
312.34	Intermittent Explosive Disorder	02
298.90	Psychotic Disorder, NOS	02
298.90	Psychotic Disorder, NOS	03
314.90	Attention Deficit Hyperactivity Disorder, NOS	03
312.80	Conduct Disorder	04
311.00	Depressive Disorder, NOS	04
298.90	Psychotic Disorder, NOS	05
314.90	Attention Deficit Hyperactivity Disorder, NOS	05
309.81	Posttraumatic Stress Disorder	05
309.81	Posttraumatic Stress Disorder	06
314.90	Attention Deficit Hyperactivity Disorder, NOS	06
311.00	Depressive Disorder, NOS	06
311.00	Depressive Disorder, NOS	07
314.90	Attention Deficit Hyperactivity Disorder, NOS	07
313.81	Oppositional Defiant Disorder	07
311.00	Depressive Disorder, NOS	08
314.90	Attention Deficit Hyperactivity Disorder, NOS	08
298.90	Psychotic Disorder, NOS	08
309.81	Posttraumatic Stress Disorder	09
314.90	Attention Deficit Hyperactivity Disorder, NOS	09
312.80	Conduct Disorder	09
298.90	Psychotic Disorder, NOS	09
298.90	Psychotic Disorder, NOS	10
314.90	Attention Deficit Hyperactivity Disorder, NOS	10

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(Appendix B, continued.)

313.81	Oppositional Defiant Disorder	10
311.00	Depressive Disorder, NOS	11
314.00	Attention Deficit Disorder, Predominantly Inattentive	11
311.00	Depressive Disorder, NOS	12
314.90	Attention Deficit Hyperactivity Disorder, NOS	12
312.80	Conduct Disorder	13
312.30	Impulse-Control Disorder, NOS	13
314.90	Attention Deficit Hyperactivity Disorder, NOS	13
312.34	Intermittent Explosive Disorder	14
314.90	Attention Deficit Hyperactivity Disorder, NOS	14
313.81	Oppositional Defiant Disorder	15
314.90	Attention Deficit Hyperactivity Disorder, NOS	15
298.90	Psychotic Disorder, NOS	15
296.60	Bipolar Disorder, Mixed	16
309.81	Posttraumatic Stress Disorder	16
311.00	Depressive Disorder, NOS	17
314.90	Attention Deficit Hyperactivity Disorder, NOS	17
313.81	Oppositional Defiant Disorder	18
298.90	Psychotic Disorder, NOS	18
311.00	Depressive Disorder, NOS	18
312.80	Conduct Disorder	19
314.90	Attention Deficit Hyperactivity Disorder, NOS	19
312.30	Impulse-Control Disorder, NOS	20
313.81	Oppositional Defiant Disorder	20
311.00	Depressive Disorder, NOS	20
298.90	Psychotic Disorder, NOS	20
296.80	Bipolar I Disorder, NOS	21
313.81	Oppositional Defiant Disorder	22
314.90	Attention Deficit Hyperactivity Disorder, NOS	22
313.81	Oppositional Defiant Disorder	23
311.00	Depressive Disorder, NOS	23
314.90	Attention Deficit Hyperactivity Disorder, NOS	23
313.81	Oppositional Defiant Disorder	24
314.90	Attention Deficit Hyperactivity Disorder, NOS	24
313.81	Oppositional Defiant Disorder	25
314.90	Attention Deficit Hyperactivity Disorder, NOS	25
300.30	Obsessive-Compulsive Disorder	26
314.90	Attention Deficit Hyperactivity Disorder, NOS	26
312.80	Conduct Disorder	27

(Appendix B continues on the next page.)

(Appendix B, continued.)

314.90	Attention Deficit Hyperactivity Disorder, NOS	28
313.81	Oppositional Defiant Disorder	29
311.00	Depressive Disorder, NOS	29
298.90	Psychotic Disorder, NOS	29
312.80	Conduct Disorder	30
312.80	Conduct Disorder	31
314.90	Attention Deficit Hyperactivity Disorder, NOS	31
311.00	Depressive Disorder, NOS	32
312.80	Conduct Disorder	32
314.90	Attention Deficit Hyperactivity Disorder, NOS	32

Note. NOS = Not otherwise specified.

APPENDIX C

Appendix C

Summary of Subjects' Psychiatric Diagnoses

Listed by Codes from the

Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition [DSM-IV]

(American Psychiatric Association, 1994).

<u>Code No.</u>	<u>Psychiatric Disorder</u>	<u>Frequency of Occurrence^a</u>
314.90	Attention Deficit Hyperactivity Disorder, NOS ^b	23
311.00	Depressive Disorder, NOS	12
298.90	Psychotic Disorder, NOS	10
313.81	Oppositional Defiant Disorder	10
312.80	Conduct Disorder	9
309.81	Posttraumatic Stress Disorder	5
312.30	Impulse-Control Disorder, NOS	2
312.34	Intermittent Explosive Disorder	2
314.00	Attention Deficit Disorder, Predominantly Inattentive	1
296.80	Bipolar I Disorder, NOS	1
296.60	Bipolar Disorder, Mixed	1
300.30	Obsessive-Compulsive Disorder	1

Note. ^aMaximum possible = 32; ^bNOS = Not otherwise specified.

APPENDIX D

Appendix D

Lindamood Auditory Conceptualization Test-Revised Edition

The Lindamood Auditory Conceptualization Test-Revised Edition [LAC]

(Lindamood & Lindamood, 1979) includes three categories or subtests consisting of encoding tasks the authors state are similar to those involved in reading and spelling (p. vii). Conceptualizing points of contrast between sound patterns is essential in developing skills the authors describe as "transcoding, or translating, from auditory to visual in spelling and from visual to auditory in reading" (p. 4). The test's sound-contrast tasks require the ability to make fine discriminations regarding the identity, number, and sequence of spoken sounds. Materials include 24 colored blocks (4 each of red, yellow, green, white, blue, and black), an examiner's cue sheet with instructions for administration of the pretest and sample demonstrations for each subtest, and individual response forms.

The consonants used in the two categories of the LAC represent the major subclasses of phoneme structure, and the vowels are all "short" sounds. The test items gradually increase in the complexity of stimuli patterns. Category 1-A, for example, requires only that the subject discriminate the number of sounds heard and whether they were the same or different. Sample items from Category 1-A include: "Show me /s/, /s/." "Show me /o/, /a/, /u/." Category I-B adds the task of identifying the sequential order of same/different phonemes. Category I-B sample items are: "Show me /b/, /b/, /z/." "Show me /k/, /t/, /k/." Category II patterns begin with simple nonsense syllables representing

(Appendix D continues on the next page.)

(Appendix D, continued.)

most of the possible consonant-vowel contrasts and then progress to more complex syllables. This subtest begins as follows: "Show me /l/. If that says /l/, show me /Ip/." The phonetic manipulations become more complicated as the following sample items indicate: "If that says /uts/, show me /ust/. If that says /ust/, show me /sust/." There is a total of 38 possible points, 10 on Category I-A, 6 on Category I-B, and 12 on Category II. This raw score then becomes a converted score, which is compared to the test's grade-level recommended minimum score.

The LAC was standardized on 660 subjects in grades kindergarten to 12. The authors derived recommended minimum scores from the subjects' performances, setting criterion scores for the first and second halves of grades kindergarten through seventh. Adult performance is expected from the seventh grade on. Because the criterion scores were intentionally set high to ensure identification of deficits in phonemic analysis, only 41.83% of the standardization sample performed at passing levels for grades 2 through 7+. However, 84.17% of these subjects achieved scores greater than 41 to 50, which represented correct responses to at least half of the test items.

Validity for the LAC was reported in terms of its ability to predict reading and spelling skills in 660 students in grades kindergarten through twelfth. The subjects' LAC scores were compared with scores from reading and spelling subtests of the Wide Range Achievement Test [WRAT] (Jastack & Jastack, 1965). Correlations between the scores on these instruments ranged from .66 to .81 ($M = .73$) for all grade levels, indicating (Appendix D continues on the next page.)

(Appendix D, continued.)

moderate-to-high correlations between the two instruments. Test-retest reliability using two forms of the LAC, Forms A and B, was reported as .96.

APPENDIX E

Appendix E

Clinical Evaluation of Language Fundamentals-Revised Screening Test

The Clinical Evaluation of Language Fundamentals-Revised Screening Test

[CELF-R Screening Test] (Semel, Wiig, & Secord, 1989) contains six sections, plus two supplemental sections to screen oral and written expression. Only sections one through six were used to evaluate the subjects' abilities in the areas of morphology, linguistic concepts, sentence imitation, semantic relationships, and sentence formulation. The test utilizes a stimulus manual with line drawings (pictures) and printed words. Section 1 uses picture stimuli and a carrier phrase format to elicit a response based on a morphological rule. For example, the subject is shown a picture of a boy and dog and told, "This is Jack. Whose dog is this? It is _____." The subject responds with "Jack's."

The picture stimuli used with Section 2 display the concepts of big, small, black, white, star, circle, and house. The subject is given one- to three-unit verbal commands requiring discrimination in size, color, and orientation of the symbols. For example, the subject is shown a picture of five stars, one of which is small and white, one small and black, two big and white, and one big and black. The subject is commanded to "Point to the first big, white star."

Section 3 is a sentence imitation task with items which include modifiers, phrase and clause coordination and subordination, and relative pronouns. The sentences progress to greater difficulty. The sentences are read by the examiner and repeated by the subject. (Appendix E continues on the next page.)

(Appendix E, continued.)

An example is as follows: "After the girls had finished studying, they planned to get some ice cream at the store."

Section 4 is also presented orally as four words are read by the examiner. The subject identifies two of the words which form an association. From "boy, boat, train, and circle" the subject chooses "boat and train" which share the category of transportation.

The items for Section 5 are read by the examiner from pages in the stimulus manual as the subject follows along. The items target semantic features such as comparative, spatial, or temporal relationships. For example, the examiner reads the following: "In the same day, afternoon is later than...." Next the four answer choices are read: "a) midnight, b) morning, c) evening, d) dawn." The subject follows the reading in the stimulus manual and chooses the answers "morning" and "dawn." Two responses are required for each item.

Section 6 requires sentence formulation with simple sentences which feature direct and indirect objects, conjunctions, negatives, temporal subordination of clauses, and relativization. The scrambled words or phrases are presented visually from the stimulus manual and read by the examiner. The subject must produce two different sentences for each item. For example, the scrambled words "the coat/ the man/ the closet/ put/ didn't/ in" are read and shown to the subject. The subject responds with "The man didn't put the coat in the closet." and "Didn't the man put the coat in the closet?"

(Appendix E continues on the next page.)

(Appendix E, continued.)

There are 45 points possible in the six sections, 13 in Section 1 and 8 in each of the others. The correct responses are totaled and compared to age-based criterion scores to determine whether the subject passes or fails the screening evaluation.

The CELF-R Screening Test was standardized on 2,273 subjects between the ages of 5 to 16 years. The sample contained 48.5% males and 51.5% females. The average raw score for subjects aged 7 to 15 years was 38.11.

Validity for the CELF-R Screening Test was reported by the authors in terms of its agreement with the full version, the Clinical Evaluation of Language Fundamentals-Revised. Correlations between the screening and the full version ranging from .66 to .87 were given as evidence of concurrent validity. Confidence ranges for avoiding false negative errors were reported between 93% and 99% based on age levels. Reliability was based on results of a test-retest study of 128 subjects selected from the standardization sample for ages 6, 10, and 14 years. Pearson product-moment correlation coefficients ranged from .68 to .87, indicating good test-retest reliability for the CELF-R Screening Test (Bruning & Kintz, 1977).

APPENDIX F

Appendix F

A Screening Test for Auditory Processing Disorders

A Screening Test for Auditory Processing Disorders [SCAN] (Keith, 1986)

consists of three subtests and is designed for children ages 3 years to 11 years. Subtest one, Filtered Words, presents a degraded signal low-pass filtered at 1000 Hz for two lists of 20 monosyllabic words, 10 presented to the right ear and then 10 presented to the left ear. Four practice words are provided. An example of a prerecorded stimulus item is: "The word is *had*." The subject then repeats the word "had." Subtest two, Auditory Figure Ground, includes two lists of 20 undistorted monosyllabic words presented with speech babble noise at +8 dB speech-to-noise ratio. Again, four practice words are given and then 20 words with background noise are presented to the right ear, followed by 20 words and background noise to the left ear. The subject hears a stimulus item such as "The word is *all*," and then repeats the word "all." The Auditory Figure Ground subtest evaluates word discrimination ability in the presence of competing background noise. The Filtered Words and the Auditory Figure Ground subtests are considered representative of listening conditions in a typical classroom setting. Poor performance on these subtests may indicate difficulties with comprehending words in various listening situations (Keith, 1986).

The third subtest, Competing Words, consists of two lists of 25 monosyllabic word pairs presented binaurally with simultaneous onset times. After two practice items, the (Appendix F continues on the next page.)

(Appendix F, continued.)

listener is required to repeat each of the first 25 word pairs, starting with the words presented to the right ear first. For example, the subject hears "The word is *drop/hen*," and repeats "drop" first because it was presented in the right ear and then "hen" which was presented in the left ear. With the second 25 word pairs, the listener repeats both words starting with the words presented to the left ear first. Credit is given for each word correctly repeated, whether given out of order or without the other member of the pair. This dichotic test also indicates maturation of the auditory system (Keith, 1986).

The SCAN was standardized on a sample of 1,034 children between the ages of 3 and 13 years. Males comprised 47.8% of the sample and females 52.2%. For ages 7 to 11 years, raw scores averaged 145.6. Standard scores were derived from the scores achieved by the subjects within the normative group.

APPENDIX G

Appendix G

A Test for Auditory Processing Disorders in Adolescents and Adults

For subjects 12 years and older, A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] (Keith, 1994) includes the subtests described for the SCAN with the addition of a fourth, the Competing Sentences subtest. Also, the number of stimuli is reduced from 25 word pairs per ear to 15 on the Competing Words subtest. The Competing Sentences subtest includes four practice items and two sets of 10 sentence pairs presented with simultaneous onset and offset times. The listener repeats only the sentence presented to the right ear for the first set of 10 and then repeats the sentence heard in the left ear for the second set of 10 sentence pairs. For example, the subject hears in his right ear and repeats "The park is near the road" while hearing in his left ear and ignoring "The dog drank from a bowl." Poor performance on this task indicates problems with the developmental level of the auditory system, auditory maturation, or hemispheric specialization (Keith, 1994, p. 3).

The SCAN-A was standardized on 125 subjects between the ages of 12 and 50 years. The mean raw score for subjects 12 to 18 years was 143.95. Standard scores were derived from frequency distributions within the normative sample.

Validity for the SCAN and SCAN-A was reported by Keith in terms of content, construct, and criterion-related validity. The tasks utilized by these instruments to measure general auditory processing ability were shown to be well supported by previous (Appendix G continues to the next page.)

(Appendix G, continued.)

research, by moderately significant coefficients between subtests, and by low but positive correlations between these instruments and general measures of language. Reliability was reported on results of the performance of 38 subjects in a test-retest study as a coefficient of .69 for test-retest reliability.

APPENDIX H

Appendix H

Subject Scores on the LAC, CELF-R Screening Test, SCAN, and SCAN-A

Sub. No.	IQ	AGE	LAC	<u>CELF-R</u> <u>Screening Test</u>	SCAN	SCAN-A
01	85	12:4	82	34		56
02	89	11:5	63	18	65	
03	76	12:8	47	19		50
04	80	11:8	50	20	122	
05	74	12:6	45	9		69
06	89	12:10	79	36		50
07	83	12:4	86	35		65
08	86	12:10	63	27		77
09	71	12:4	57	18		50
10	93	10:4	65	17	78	
11	93	12:2	76	28		40
12	95	11:9	76	42	100	
13	87	12:0	75	32		64
14	81	11:1	37	19	85	
15	78	12:0	30	14		67
16	99	7:9	37	17	77	
17	92	8:10	41	19	100	
18	96	14:6	82	33		75
19	96	12:4	49	18		40
20	82	14:10	94	30		92
21	82	13:0	44	17		40
22	84	15:1	72	32		33
23	99	15:4	66	35		69
24	89	11:3	38	33	81	
25	90	9:0	43	12	69	
26	88	8:8	56	21	81	
27	82	13:5	69	28		54
28	117	10:2	92	27	100	
29	73	13:4	44	22		42

(Appendix H continues on the next page.)

(Appendix H, continued.)

Note. IQ refers to Full Scale Intelligence Quotient. Age is reported in years:months. The Lindamood Auditory Conceptualization Test-Revised Edition [LAC] raw scores are converted to criterion scores based on grade level and labeled as Recommended Minimum Scores. Two sets of scores are given, one for the first half and one for the second half of the school year. Recommended Minimum Scores for the year's second half were used in this study and are as follows (grade/recommended minimum score): 2/71, 3/81, 4/86, 5/93, 6/99, and 7+/99. Age-based criterion scores are provided for the Clinical Evaluation of Language Fundamentals-Revised Screening Test [CELF-R Screening Test] as follows (age/criterion score): 7/19, 8/24, 9/28, 10/31, 11/34, 12/36, 13/32, 14/34, 15/35. A Screening Test for Auditory Processing Disorders [SCAN] and A Test for Auditory Processing Disorders in Adolescents and Adults [SCAN-A] utilize standard scores based on a mean of 100 with a standard deviation of 15.

VITA

Carolyn Ann Drake was born in Ravenna, Ohio on November 11, 1943. She attended elementary and high schools in Brecksville, Ohio, where she graduated in 1961. In June, 1962 she completed a one-year program at Dyke Business College and began working as a medical secretary in Jasper, Texas. In 1990, after marriage and the birth of four children, she entered Edison Community College in Fort Myers, Florida, where she earned an Associate of Arts degree in May, 1992, and was named the Outstanding Scholar for 1991-92. After moving to Tennessee, she attended The University of Tennessee, Knoxville and graduated summa cum laude in May, 1994 with a Bachelor of Arts degree in Speech Pathology. At this time, she was named the Top Graduating Senior for the College of Liberal Arts-Social Sciences. She was accepted into The University of Tennessee, Knoxville Graduate School in August, 1994 and was awarded the Hilton A. Smith Fellowship for both 1994-95 and 1995-96. She earned her Master of Arts degree in speech pathology from The University of Tennessee, Knoxville in December, 1996.