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Examination of the Issues and Scientific Evidence for the Identification process of Deaf and Hard of Hearing Individuals with Learning Disabilities to Enhance Academic Outcomes

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EXAMINATION OF THE ISSUES AND SCIENTIFIC EVIDENCE FOR THE
IDENTIFICATION PROCESS OF DEAF AND HARD OF HEARING INDIVIDUALS
WITH LEARNING DISABILITIES TO ENHANCE ACADEMIC OUTCOMES

by

Scot Ferre

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ABSTRACT

EXAMINATION OF THE ISSUES AND SCIENTIFIC EVIDENCE FOR THE IDENTIFICATION PROCESS OF DEAF AND HARD OF HEARING INDIVIDUALS WITH LEARNING DISABILITIES TO ENHANCE ACADEMIC OUTCOMES

By Scot Ferre, Master of Science
Utah State University, 2006

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Department: Psychology

Although the identification of learning disabilities (LD) is a viable means to provide appropriate instructional and support services for students with academic difficulties, there is a limited knowledge base about the identification, assessment, and intervention of and for LD in deaf and hard of hearing (D/HH) students. Given the potential consequences of test results, this review examined current and recent developments in the field of learning disabilities concerning the conceptualization of learning disability and the validity and empirical support of earlier identification methods and various assessment identification options with D/HH students. Challenges to the process and the need for additional assessment and empirically validated treatment options are discussed. Until future research provides more explicit guidelines, a case example with a proposed framework and troubleshooting for critical areas that may interfere with accurate data-based decision-making is suggested for defining LD that school psychologists can incorporate in current practice.
I would like to acknowledge the valuable contributions from my committee: Donna Gilbertson, who is the chair; J. Freeman King; and James Blair. All three are currently professors at Utah State University. I also wish to acknowledge my father’s input and work as he helped me in many various ways, including his expertise as a child psychiatrist, his emotional support, and his willingness to help me achieve the best I can do in many of my endeavors. I would also like to thank Gary Mauk, McCay Vernon, and Jeffrey Braden for their personal correspondence and gracious use of their articles. I also thank my family and friends who have stuck with me as I went through this long writing process, particularly my wife who has tremendous patience.
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With implementation of a 12-minute brief intervention, Jay’s scores improved at a faster rate than his D/HH peers and consistently above the aim line (increase of 2 words per week).

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INTRODUCTION

Within the deaf/hard of hearing (D/HH) population, there is evidence of a subgroup that, in addition to their deafness, may also have learning disabilities (Bunch & Melnyk, 1989; Elliot et al., 1988; Powers et al., 1987; Mauk & Mauk, 1998). Craig and Craig (1987) report that the largest subgroup of deaf people who have an additional disability are those with learning disabilities. Learning disabilities in D/HH individuals affect many domains in their lives. For example, reading skills, which are critical to success in the workforce, may be doubly impaired due to the nature of deafness and learning disabilities, both of which affect auditory language capabilities.

In order to provide effective educational services to children, it is critical that school professionals identify those in need of remedial assistance due to a disability before the problem becomes so severe that it is difficult for a child to “catch up” to their peers’ performance. Although deaf and hard of hearing students qualify for special education services due to their loss of hearing as their primary disability, it is critical that secondary disabilities be identified in order to provide appropriate educational interventions. Many studies have indicated that intervention has the potential to correct these deficits and to avoid any serious delays in academic success (Donovan & Cross, 2002). Unfortunately, schools frequently practice a “wait to fail” approach, meaning that children are not identified, nor intervention begun until they are performing substantially below the expected level of performance. But by identifying these students, academic regimens can be modified to maximize their learning potential in order to develop those skills.

The identification of LD in students is guided by the provisions set forth in the Individuals with Disabilities Education Act (IDEA) amendments of 2004. This federal law
ensures that students with disabilities are entitled to the same educational experiences as all other children. The law outlines definitions of disabilities within school systems and how to proceed with identification of students with disabilities. Once identification is made, steps can be made to modify the learning environment for the benefit of the student. In the specific definition of LD, the law has listed specific conditions that are included as part of LD, and those which are not (Individuals with Disabilities Education Improvement Act of 2004).

Prior to IDEA 2004, the law proposed that LD can be identified by demonstrating a severe discrepancy between performance on intelligence and achievement tests. This approach has been the predominant method of identifying LD students, but has come under criticism in recent years. Research studies over the past twenty years have found that this method is often unreliable and has questionable validity and utility when used to identify LD in students (Gresham & Witt, 1997).

The spectrum of D/HH students, which range from a mild to a total hearing disability, and from those who are solely oral/aural to those who use only signed language for receptive and expressive language, pose special challenges for educators to identify a discrepancy between academic and cognitive abilities. One primary concern is the lack of valid academic and cognitive tests that can accurately measure a severe discrepancy for D/HH students. In addition, it raises questions about whether these academic difficulties are a result of environmental factors or the disability itself.

To enhance the accuracy in identifying students who truly have a learning disability, the most recent revision of IDEA proposes that schools consider an alternative option to the discrepancy approach (U.S. Department of Education, 2005). This alternative, the responsiveness to instruction model (RTI), assesses the student’s responsiveness to different levels of
intervention. The approach in the RTI model is to assess the academic proficiency of all students and then compare the individual student’s progress to the entire class’s standard of achievement. This approach has the advantage of evaluating the effect of the teaching environment on the learning process. Moreover, this data will identify which students are not responding to a specific curriculum and are therefore academically at-risk.

Regardless of the assessment model used to identify learning disabilities (LD), identification of LD within the D/HH population is much more difficult to assess than children with no other disabilities for several reasons. One, the diagnostic tools used for assessing learning disabilities within hearing individuals are inappropriate for the D/HH population due to some critical differences between the two populations (Sikora & Plapinger, 1997; Morgan & Vernon, 1994; Roth, 1991; Mauk & Mauk, 1998). Two, there is a lack of decision-making criteria that is data-based with which professionals can identify learning disabilities in the D/HH population (Berent, Samar, & Parasnis, 2000; Powers, Elliott, & Funderburg, 1987; Morgan & Vernon, 1994; Powers, Elliott, Fairbank, & Monaghan, 1988; Elliott, Powers, & Funderburg, 1988; Mauk & Mauk, 1998). Three, the identification of learning disabilities is compromised by critical environmental factors that may hinder reading progress which are not due to a disability, such as degree of fluency in sign language/oral skills, and whether there is a social network in the student’s life to develop language skills (Mauk & Mauk, 1998). For hard of hearing students, Delaney et al. (1984) suggested that reading achievement is dependent on several factors: the type of instructional input, the teacher’s skills and knowledge, curriculum design, parents or caregivers’ involvement, and conversational skills development. Motivation and interest also play a major role.

The purpose of this paper will be to review the literature to examine the different options
for LD identification and the difficulties of assessment of learning disabilities within the deaf/hard of hearing populations, to propose strategies for working with the LD D/HH population that would better meet federal guidelines, and to improve current assessment procedures for identifying academic problems and disabilities. For the purpose of this paper, learning disabilities will be confined to learning disabilities due to difficulties in reading since this is the most prevalent form of LD (Morgan & Vernon, 1994). The main questions of interest in this review are:

1. What are LD identification assessment options and regulations?
2. What are the advantages and disadvantages of each option?
3. What is the empirical evidence for D/HH students with each option?
4. What are specific assessment and interpretation considerations that need to be addressed to achieve an accurate diagnosis of LD within the D/HH populations?
5. What are the implications of this literature review for school psychologists?
INCLUSION/EXCLUSION CRITERIA FOR CURRENT REVIEW

Relevant articles for this literature review were located using the PsycINFO database. The search terms used to locate articles included “deaf,” “hard of hearing,” and “hearing-impaired” paired with “learning disabilities,” “reading disabilities,” “cognitive or intelligence assessment,” and/or “achievement or reading assessment.” In addition, references from the articles gathered also provided further relevant articles. Finally, the author contacted a few researchers who wrote some of the articles for their recommendations of other articles for additional information in this literature review. Articles published in peer reviewed journals between 1980 to present that include school-aged children with learning disabilities in reading or at-risk for LD were reviewed. Relevant review articles and chapters that are related to learning disabilities in the hearing population that primarily cite empirical studies were also included.

Studies were excluded if authors only briefly discussed or reviewed learning disabilities within the deaf and hard of hearing populations, presented strategies that are not empirically supported and/or are not school-based practices (e.g., horse-riding or music evaluations), or included deafblind participants.

Finally, each study that met the inclusion criteria was summarized in a matrix format (see Appendix 1) to synthesize information regarding empirically validated assessment procedures with D/HH students. This matrix was used to examine and compare the empirical evidence for various types of assessment options with D/HH students. Specifically, participants, dependent variables, independent variables, method design, overall findings, and implications of practice were reviewed and summarized for each study.
PURPOSE OF LITERATURE REVIEW

This literature review will analyze current empirical findings about the assessment of learning disabilities in the deaf/hard of hearing population. The first section will provide a brief background on the definition of LD. The following section will describe and summarize results of studies examining assessment for identification of learning disabilities within the deaf/hard of hearing population as well as the hearing population, and will examine the advantages and disadvantages to various assessment method options. Following the review of research on assessment options, studies examining relevant assessment and interpretation considerations that enhance accurate and valid assessment outcomes for D/IIll students will be reviewed. Concluding the paper will be a summary of review results and implications of the research for practicing school psychologists and implications for future research in this area.

GENERAL BACKGROUND

The largest subgroup of D/IIll people who have an additional disability are those with learning disabilities (Craig & Craig, 1987). Estimated prevalence rates of LD in the D/IIll population range from 23% (Elliot et al., 1988) to 11% (Powers et al., 1988) to 6.7% (Powers et al., 1987).

In order to understand learning disabilities within the D/IIll population, several factors must be considered. One factor is that learning disabilities are not well-defined and those definitions which are available can be vague, even for the hearing population (Kavale & Forness, 2000). There are various definitions of learning disabilities within the hearing population. Fuchs et al. (2004) states that the plain and simple definition of LD is “unexpected failure to learn” (p. 216). A discrepancy between current and expected achievement has been termed as the
"keystone" (Fuchs et al., 2004, p. 216) construct for defining unexpected failure to learn. The discrepancy model attempts to assess if there is an unexpected failure to learn given an average ability to learn. Four major methods are used to compute a discrepancy between achievement and cognitive ability, including: deviation from grade level, expectancy formulas (a comparison between a child's expected and observed grade level), simple standard score difference (between IQ and achievement measured on standardized tests), and standard regression analysis.

There is no official definition that incorporates both deafness and learning disabilities. To complicate this matter further, the guidelines found in the Individuals with Disabilities Education Act contains an exclusionary clause that does not allow learning disabilities to be diagnosed when it is primarily the result of certain physical disorders, such as deafness (Individuals with Disabilities Education Act Amendments of 1997).

The IDEA definition for LD is as follows:

The group may determine that a child has a specific learning disability if (1) The child does not achieve commensurate with the child's age in one or more of the following areas, when provided with learning experiences appropriate for the child's age: (i) Oral expression, (ii) Listening comprehension, (iii) Written expression, (iv) Basic reading skill, (v) Reading fluency skills, (vi) Reading comprehension, (vii) Mathematics calculation, and (viii) Mathematics problem solving. (2)(i) The child fails to achieve a rate of learning to make sufficient progress to meet State-approved results in one or more of the areas identified in paragraph (a)(1) of this section when assessed with a response to scientific, research-based intervention process; or (ii) The child exhibits a pattern of strengths and weaknesses in performance, achievement, or both, or a pattern of strengths and weaknesses in performance, achievement, or both, relative to intellectual
development, that is determined by the team to be relevant to the identification of a specific learning disability, using appropriate assessments consistent; and (3) The group determines that its findings are not primarily the result of (i) A visual, hearing, or motor disability; (ii) Mental retardation; (iii) Emotional disturbance; (iv) Cultural factors; or (v) Environmental or economic disadvantage. (b) For a child suspected of having a specific learning disability, the group must consider, as part of the evaluation, data that demonstrates that (1) Prior to, or as a part of the referral process, the child was provided appropriate high-quality, research-based instruction in regular education settings, including that the instruction was delivered by qualified personnel; and (2) Data-based documentation of repeated assessments of achievement at reasonable intervals, reflecting formal assessment of student progress during instruction, was provided to the child’s parents (Individuals with Disabilities Education Improvement Act of 2004, 34 C.F.R. 300.309).

The IDEA definition for LD is problematic for at least two reasons. Firstly, it states that the learning problem cannot be caused by certain factors, including hearing disabilities. The challenge with this statement is the difficulty in separating the effect of the hearing disability from a learning disability, since both can influence language acquisition and fluency that in turn influence reading progress. How is a practitioner to know which factor(s), if any, or both, is/are affecting language ability while assessing LD in a D/HH student? Secondly, the use of the word “cultural” in the definition can cause conflict with the fact that some students’ primary language is American Sign Language (ASL), which does not have equivalence to written English. ASL has its own grammatical structure and no written form. It is also a component of the Deaf Culture, which can influence societal and linguistic traditions and opportunities.
The IDEA definition also causes ideological conflicts with professionals who are faced with D/HH students who may have LD. Although some professionals feel that deafness cannot be concomitant with LD, Sabatino (1983) and Mauk & Mauk (1998) strongly argued to the contrary that they can coexist within the individual. Other professionals report that they are hesitant to provide additional services for the learning disability when services are already being provided for the disability of deafness (Roth, 1991). However, if learning problems exist due to a disability that requires differential services in order to improve learning, then identification of the disability is warranted.

Definitions of LD have been proposed by NJCLD (National Joint Commission for Learning Disabilities) to allow LD to be concomitant with deafness. The 1994 NJCLD definition is as follows:

*Learning disabilities* is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g. sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g., cultural differences, insufficient/inappropriate instruction, psychogenic factors), it is not the result of those conditions or influences. (National Joint Committee on Learning Disabilities, 1994, pp. 65-66)
NJCLD's 1994 definition seems to be more accommodating for the D/HH students as it states that concomitant disorders or environmental conditions may be possible at the same time, but the learning disability is not necessarily the result of such. The definition is more specific, and yet broad at the same time. LD is a "heterogeneous group of disorders" which exhibits certain difficulties with communicative activities. However, neither the IDEA definition nor the NCJLD definition is sufficient to address certain questions about identifying LD in the D/HH population. Laughton states that LD itself has components that have not been universally accepted, which resulted in "variable prevalence estimates, inability to differentiate learning disabilities from other conditions, unclear discipline boundaries, and confusion about who should deliver services" (1989, p. 71). Also, there is variable performance among individuals, and professionals are uncertain how to integrate knowledge about LD as applicable to deaf people. With more recent changes in testing and understanding of the psychology of the deaf, a refined definition with professional consensus is essential to further the work in this field.

ASSESSMENT OPTIONS FOR IDENTIFICATION OF LEARNING DISABILITIES IN D/HH STUDENTS

Given the ambiguity in LD definitions, multiple assessments to identify LD are necessary to gather an adequate amount of supportive data to confidently demonstrate that LD truly exists. Methods used to identify, classify, and place students with learning disabilities include: teacher observation and professional judgment, classroom observation by a team member, academic and psychological evaluations, and team decisions.

For deaf students, teacher referral is one primary source for the identification of learning disabilities in D/HH students. In addition, for all students, there are two additional prominent
psychological evaluation models in the assessment of learning disabilities. One is the use of a discrepancy between achievement scores and intelligence scores. The model attempts to identify learning disabilities by measuring whether the student is showing a severe discrepancy between performance in achievement tests and intelligence tests. A more recent proposed model in IDEA 2004 is the responsiveness-to-instruction (RTI) model. RTI is an assessment procedure that begins by insuring that most students are provided effective classroom instruction first. The students who do not succeed at this level of instruction are provided additional intervention to help them achieve at the same rate as the expected classroom progress. If the student fails to achieve after this intensive intervention, the child is referred for special education services.

A multidisciplinary team’s interpretation of data collected by various methods to help differentiate among groups of children having learning disabilities and low achievement often leads to different conclusions and outcomes. An analysis of the procedures and methods used for making educational decisions for children with LD characteristics is critical given that these decisions have substantial impact on services that are provided for these children. This section will summarize the empirical evidence related to the three LD identification assessment options: teacher referral, discrepancy model, and RTI. The advantages and disadvantages of these three methods of identifying learning disabilities in the deaf and hard of hearing student population also follow.

Teacher Referral: advantages and disadvantages

One of the most prevalent options for identification of LD in D/HH students is through teacher referrals. A teacher referral is defined as a procedure in which the teacher evaluates the child’s academic abilities and performance by observations of how the student performs within
the classroom. The student is compared to classmates to determine the presence of learning disability. This procedure helps identify at-risk children who are suspected of LD. It is assumed that teachers can objectively discriminate and have sufficient judgment to recognize their students’ deficiencies in order to make a referral for academic intervention (Berent et al., 2000; Powers et al., 1988; Elliot et al., 1988). The advantage that students are more accessible for observation and assessment by their teachers has been purported as well.

To estimate typical practices for making educational decisions, Powers et al. (1987) asked 105 directors of public residential schools serving the D/HH population in the U.S. to complete a survey to determine the status of D/HH students with LD as well as incidence, identification, and assessment of LD, and to learn about educational programming and the characteristic behaviors of LD D/HH students. Sixty percent of the surveys were returned. The results showed that various methods of identification were used: 1) teacher observation, 2) diagnostic assessment, 3) diagnostic observation, 4) administrator and parent observation, and 5) a formal test battery, with considerable variations in tests being utilized. This study supports the evidence that most LD D/HH students are being identified through various means, including teacher observations.

Elliot et al. (1988) further investigated the type of assessment most frequently used to identify D/HH students with LD. The authors surveyed administrators and teachers who represented 7,594 elementary and secondary students. Out of those students, 1,748 of them had another disability in addition to their hearing disability with 23% of all D/HH students also classified as LD. When asked to report preferred criteria for identifying LD, teachers reported processing and memory problems as the preferred criteria. Administrators, on the other hand, viewed the discrepancy between IQ and achievement scores as the preferred LD criteria. Both
groups named visual-perceptual problems as the second most used criteria for identifying LD in D/HH students. The authors found that teachers use different measures between evaluations for the same problem (LD) that lead to inconsistency in how the evaluations are completed and interpreted. Only 11 percent used the WISC-R as a tool for identifying LD in D/HH students. The Bender Visual Motor Gestalt Test (Bender, 1938) was the only other test to be named by more than five percent of the respondents. Also, respondents reported that teacher observation and teacher referral was the most commonly used method for obtaining information about LD in D/HH students as compared to standardized test scores. A vast majority of teachers in this study reported no assessment tools were used. This study reflects the continued dependence of teacher referral for the identification of LD in the D/HH population. There have been no consistent criteria for the identification of LD, leading the teachers and administrators to use their subjective observations as a basis for their referrals.

Powers et al. (1988) designed a study to compare various observation ratings by school professionals with Pupil Rating Scale Revised: Screening for Learning Disabilities (Myklebust, 1981), and the Meadow-Kendall Social-Emotional Assessment Inventory for Deaf and Hearing-Impaired Students (Meadow-Orlans, 1983). The authors conducted correlations between ratings and screening scores specifically related to LD identification and behavior problems to estimate the degree of agreement between test scores and ratings and factors of language, sign language, speech, learning disability, and behavior. Participating professionals included the teachers, the principal, the speech-language pathologist, and the audiologist at a residential school for the deaf. These professionals completed various ratings concerning 27 students who were selected out of a sample of 69 students. The scales were filled out to measure behavior or LD characteristics. Each professional completed a rating scale, administered twice: at the beginning
of the school year and at the end of the school year. The students' mean intelligence score was 95.8, and their hearing disability ranged from severe to profound deafness. The initial rating results indicated that 25% of the students were rated as LD by one or more raters, and 11% were rated with behavior problems. In the second rating, only three students were rated as LD (11%). Results in this study indicated that when teachers make referrals, there is a good possibility that the students referred do meet the criteria for LD according to the Pupil Rating. The authors suggest that possibly because teachers spend a considerable amount of time with their students, they develop an increased sensitivity to students’ learning problems. However, the results indicated that teachers were more likely to rate the presence of LD or behavior problems than other professionals. The study found that the identified LD D/HH students had difficulties largely associated with language (English and/or sign language). Interestingly, the students identified as LD D/HH obtained language effectiveness ratings below the mean, while those with behavior problems had language effectiveness ratings that were not below the mean.

More recently, Berent et al. (2000) conducted a study with twenty-eight professional teachers at the National Technical Institute for the Deaf (NTID) who completed a survey to examine characteristics that help professionals identify students who are suspected of LD. Observations of students were the basis of the respondents’ answers on the survey. The authors found that professionals who work with D/HH populations report different characteristics of deaf students suspected of having LD. The survey results found that the topmost two reported characteristics that differentiate between LD and non-LD deaf students were spelling errors and deficits in phonological awareness. However, there was not a consensus among all of the respondents as to which specific measures were most reliable. The study provides support for the use of teacher referrals to identify LD D/HH students. As reported, this data suggests that,
although teachers report distinguishable characteristics of LD students, specific characteristics are not reliably reported by all teachers. This results in a decreased accuracy of teacher reported characteristics that can be utilized in the identification of LD.

These studies all support the central role of teachers' input in identifying LD students in the D/HH population. There is evidence in this literature, however, of insufficient reliability and validity of these referrals. Powers et al. (1988) reported that a teacher assessment alone had the potential to overestimate the incidence of LD within D/HH students. According to this result, reliance alone on teachers' referrals has the potential to increase the incidence of false positives.

Sikora and Plapinger (1997) further investigated parents' as well as teachers' perceptions in making referrals of LD children. Parents and teachers filled out a multiple-choice questionnaire to quantitatively rate: audiological status, educational setting, cognitive and communication characteristics and academic performance. These ratings were then compared with performance on achievement and cognitive tests. Correlations between perceived and actual academic performance were computed to examine if parent responses or teacher responses correlated with actual scores from standardized tests. Correlations were found between both parent and teacher ratings of academic ability and academic standard scores, ranging from .59 to .89. However, no significant correlations were found between parent and teacher perception of students' difficulties in visual perceptual problems (measured by the Test of Visual Perceptual Skills - Revised [Gardner, 1996]), memory problems (measured by the Wide Range Assessment of Memory and Learning [Sheslow & Adams, 1990]), and organizational problems (measured by The Developmental Test of Visual Motor Integration [Beery, 1982]). These results indicate that parent and teacher input is a more accurate estimation of academic performance than a student's cognitive deficits that may influence learning. As the teacher observes the student, and the
student is not progressing academically, the teacher and parent may be able to refer that student for identification purposes so that the problem can be addressed. However, the authors advise that thorough psycho-educational evaluations may provide valuable and accurate information regarding processing deficits underlying poor academic performance.

This review of the literature on teacher observations for referral suggests that there is a lack of sufficient evidence in the literature for the reliability and validity of characteristics in identifying LD in D/H students. Until additional research is done to provide more reliable procedures, which can be implemented in schools, teacher referrals will remain critical in identifying LD in D/H students in order for them to obtain the needed resources for academic achievement. However, teacher observation does not provide relevant information on the type of learning disability that may link to appropriate educational programming.

The IQ-Achievement Discrepancy: advantages and disadvantages

Before IDEA 2004, the federal law suggested that LD may be identified by demonstrating a severe discrepancy between performance on intelligence tests that indicates adequate cognitive ability to learn and achievement tests that indicate learning has not been achieved as cognitively expected. Many professionals in school districts nationwide use the discrepancy model as a criterion for identifying learning disabilities.

Sikora and Plapinger (1994) illustrated the use of standardized psycho-educational diagnostic instruments to identify learning disabilities in D/H populations and to differentiate between non-LD and LD D/H students. A series of standardized psycho-educational tests that are commonly used in the diagnosis of LD in the hearing population were administered to 16 students. Audiological, speech and language, psychological, psycho-educational, and
occupational therapy measures were also given. The study revealed that using these measures, LD in D/HH students were identified with a frequency similar to the hearing population: 75% of the students had normal cognitive and achievement scores; 2 students (11%) were identified as LD; and 12% had low cognitive and achievement scores. Prior studies suggest that between 7% and 15% of the normally hearing population have some form of learning disability (Taylor, 1988). The LD D/HH students in the Sikora and Plapinger study scored lower in WISC-III Information, Similarities, Vocabulary, and Comprehension subtests and had a discrepancy between Verbal and Performance scales than students performing in the normal range.

Academically, the majority of students performed at or above grade level similar to normally hearing peers. However, linguistic and academic measures were low for all students but showed that the LD D/HH students had below average scores and had more problems with reading, decoding, and comprehension. Generalization of these results to larger populations however is limited because of the small sample size of volunteer students with mild to moderate hearing loss.

Sullivan and Montoya (1997) found that tests that assess cognitive ability can be administered with little difficulty; however, the preferred mode of communication is important to use in testing. All participants were tested according to their communication preferences: American Sign Language (ASL), signed English, or the oral-only directions. The authors had administered the WISC-III to 106 D/HH children between the ages of six and 16 years old. A factor analysis with this intelligence test was conducted to investigate its use with the D/HH population. The authors identified two constructs, Language Comprehension and Visual-Spatial Organization, but there were no differences in the detection of the two cognitive constructs between different communication preferences. Moreover, no significant differences were
detected on the Verbal, Performance, or Full Scale IQs scores between communication modes. When using interpreters during the administration of tests, they had little, if any, effect on scores obtained in this study.

However, the use of discrepancy as the primary criterion for LD identification has resulted in a number of problematic outcomes. For example, the LD population has increased by about 150% suggesting over-identification of LD (Kavale & Forness, 2000). The U.S. Department of Education (2000) reported that the number of children labeled learning disabled comprise more than 50 percent of all children with disabilities. This poses concerns about the methods that are being used to assess LD in children. Moreover, many districts are trying to manage the substantial increase in evaluation costs for many students who are not qualifying for services.

Without clear guidelines that defined how to measure discrepancies, state educators have devised their own formulas and definitions to serve their own local populations. These varying definitions among the states have led to significant inconsistencies in estimations of the actual prevalence of LD in students from state to state. Specific to the identification of LD with D/HH students, Powers et al. observed that the discrepancy between achievement and potential is “a nebulous criterion” (1988, p. 215) when achievement test scores from such students are generally at least two grades below average. The lower grade reading level would indicate a large majority of D/HH students with average cognitive scores as having LD and would thus result in overrepresentation of these students.

As other authors have acknowledged, Plapinger and Sikora state that reading “is language based,” and an “auditory phenomenon” (1990, p. 285). They point out that most D/HH children do not enter school with a linguistic base equal to that of their peers. Consequently, if instruction
for these students is not provided to compensate for these challenges, the limited instruction provided will confound an accurate assessment of the child's abilities. Therefore, comparing intelligence test scores and achievement scores using a discrepancy approach will be unreliable.

Nover et al. remarked that, upon examining the low literacy scores of deaf college students, “schools still have difficulty resolving basic educational issues with regard to curriculum design, instructional language choice, teacher competencies, and administrative responsibilities in a manner that enhances reading level to expected proficient levels” (1998, pp. 61-62).

In addition to psychometrical problems with discrepancy calculations, several limitations influence the accuracy and utility of the selection of students when using the discrepancy model. One such limitation would be that reliance on discrepancy measures suggests that poor performance is due to factors that are intrinsic to the child when an alternative explanation for below-expected performance may be environmental factors. For example, a low-achieving child may not have a disability but may have been exposed to inadequate or inappropriate curriculum, instruction, and motivational strategies and these factors, rather than a disability, may account for reading problems (Lyon, 1996). Thus, the IQ-achievement discrepancy does not reliably differentiate between those students who are low achievers due to ineffective instruction and those students who are low achievers due to a reading disability (Gresham & Witt, 1997). In some recent studies that reviewed empirical evidence, poor readers, some of whom had been evaluated and identified as LD with the IQ-achievement discrepancy formula and others identified as low achievers without a discrepancy, were found to have similar scores across groups when doing reading-related cognitive tasks (Fuchs et al., 2003; Fuchs et al., 2002). Some of those low achievers are part of a subgroup that may have deficits that can be resolved with the same appropriate adjustments in instruction methods as LD students. Thus, there may not be
clear differences in both the performance between LD students and low achievers, and instructional techniques that differentially benefit LD and low achievers.

There is evidence that the discrepancy method results may contain bias. For example, the IQ-achievement discrepancy has shown to be discriminatory against children of low-income families if the children have been found to have low IQ scores (Fuchs et al., 2003; Siegel, 2003). In relation to the D/HH population, IQ tests may be culturally and linguistically biased against them when tests are not administered with the child’s optimal communication mode. For example, Gordon et al. discussed the concept of “equity” (1996, p. 111) for procedures and accommodations used in testing for students with hearing disabilities. The authors pointed out a few challenges with working with the D/HH population when administering intellectual assessment tests. There is often a verbal component to many assessment tools, including IQ tests. These verbal components usually depend on the test takers’ knowledge of English. Deaf people, in general, have relatively limited English skills, and in order to accommodate that, sign language is a preferred method of administering tests. Whereas many samples of assessment testing tend to be largely based on the white, middle class population, the D/HH population is highly diverse, making some sampling norms inappropriate for use with the D/HH population.

Gordon et al. (1996) further cautioned against the use of tests that do not include a sampling norm of D/HH participants making such tests of questionable validity for that population. Further, test scores lack validity when language and content knowledge influenced by a hearing disability or life experiences confound adequate interpretation. The Performance Scale of the WISC-R was recommended by these authors because of good reliability, construct validity, concurrent validity, and norms for the D/HH population. The Verbal Scale is questionable for its use, due to its verbal content. Accommodations could be made when
administering the Verbal Scale, but Gordon et al. warns that when such accommodations occur, then it is no longer appropriate to make norm-referenced interpretations of the scores obtained through standardized test administration. Currently, very little is known about the effects of deviations from procedures designed for standardized testing. Although, as noted earlier in this review, Braden (1992) found that the IQ scores from the Performance Scale were not affected by the use of special norms and testing modifications in the administration of the WISC-R Performance Scale.

As indicated above, it is difficult to find appropriate assessment options and tools for testing the D/HH student population. Norms for the D/HH in standardized tests are few in number. Even when there are norms available, it can sometimes be the case that the norms themselves are outdated (Morgan & Vernon, 1994). Moreover, the average reading level of 18-year-old deaf or hard of hearing students is between third and fourth grade (Holt, 1993), and that makes the utilization of appropriate norms a critical psychometric for making accurate educational decisions. The Center for Assessment & Demographic Studies from the Gallaudet Research Institute (1992) published similar findings from the score summary for the Stanford Achievement Test – Hearing Impaired (SAT-HI) version (8th edition). Such results are important for the educator of the deaf and hard of hearing when assessing learning problems, such as learning disabilities because it is considered best practice to compare those deaf/hard of hearing students suspected of LD to their peers.

In a study by Traxler (2000), norms were modified by the author to provide reading level equivalents for the D/HH population for use with the Stanford Achievement Test, 9th Edition (SAT-9). To develop these particular norms, Traxler utilized the same norms that were developed by Gallaudet Research Institute (GRI). GRI has been developing norms for every
edition of the SAT for use with the D/HH population. With GRI's original sample, it included 4808 students aged eight to 18 years old. The independent variable in that study was the hearing norms as developed by the SAT's authors. Traxler used most of the GRI’s sample to modify the GRI’s norms, resulting in norms called Performance Standards (PS). Traxler examined the scaled scores used for the D/HH population to provide context for individual scores. Six subtests were used, and scores from the PS sample were compared with the hearing sample. The results of this study demonstrated that the D/HH students' performance on this test is comparable to that of hearing students. Professionals can use the norms developed by GRI to give SAT-9 scores meaningful comparison to hearing students’ scores. Grade equivalent scores can also be obtained for the D/HH population. Scores from the GRI norms can be interpreted correctly for the D/HH population when compared with the hearing population.

A fourth criticism of the discrepancy model is that there is often a “wait and see” approach until the student demonstrates a substantial discrepancy between current and expected performance. By “waiting” for a wide gap between actual and expected performance to develop, the student’s academic needs are not met during an interval when intervention may effectively decrease the achievement gap between a child’s and their peers’ reading performance. When such events occur, professionals should determine if the low achievement scores could be a result of poor teaching rather than a result of the student’s disability (Fuchs et al., 2003; Vaughn & Fuchs, 2003). The “wait to fail” approach is particularly detrimental to D/HH populations who make slow gains as compared to hearing populations.

To summarize, studies indicate that many current standardized tests may not accurately identify LD in the D/HH population. Thus, schools need to consider additional assessment options to identify LD in D/HH students.
Responsiveness-to-Instruction: advantages and disadvantages

An alternative approach, responsiveness-to-instruction (RTI), for identification of disabilities has been proposed in new IDEA legislation (U.S. Department of Education, 2005). A student’s response to interventions is an approach used to identify LD in students who are not responding to generally effective instruction in general education instruction, curriculum, and to various levels of intense remediation efforts (Fuchs et al., 2004). RTI’s purpose is to differentiate between two possible etiologies of low achievement: poor instruction versus disability.

Fuchs (1995) described three “Phases” that are used in RTI assessment to meet this purpose. Phase I is to develop an instructional environment in general education that nurtures a successful outcome for most students. In this environment, the growth of students is frequently tracked to determine the mean rate of growth of academic performance within the curriculum to ensure that most students are performing as expected. Phase II identifies students whose level and rate of performance is below that of their peers performing within a generally effective instruction and curriculum. Lower levels or rates of performance signals a student’s unresponsiveness to effective instruction within the general education curriculum and indicates that these children may benefit from additional instructional support. Phase III develops an individualized instruction for the identified at-risk student(s) to identify what intensity of support is needed in order increase academic performance. Student progress is monitored when an intervention is conducted with reasonable accommodations to determine if the general classroom can reasonably meet the students’ needs adequately or if the student requires more intense services, such as special education.

With frequent progress monitoring of all students receiving the general education
curriculum, RTI seeks to eliminate poor instruction as an explanation for low achievement in students and identify these problems before a large achievement gap develops between a child and their same-age peers. RTI has the advantage of identifying students with significant disabilities that are not due to cultural, language, or motivation factors by comparing their progress to peers with similar experience who are learning within the same curriculum. The hypothesis for this model predicts that the LD students identified by the RTI method and given appropriate special education will be the students with the greatest academic need, which in turn suggests a learning disability (Vaughn & Fuchs, 2003).

One advantage of RTI is early identification. The IQ-achievement discrepancy frequently had a “wait and see” approach, whereas RTI emphasizes prevention by frequent progress monitoring of all student performance within the curriculum and making curriculum adjustments or pre-referral intervention to promote achievement when problems first emerge (Vaughn & Fuchs, 2003; Fuchs et al., 2004). This has the benefit of preventing below average achievement in the early grades or when problems first emerge as well as improved identification of the at-risk-student (Fuchs et al., 2004).

Another advantage is the potential development of a local normative framework within the general education system. Progress monitoring of all students develops a profile to define a standard for achievement in a general population of students, thereby setting an appropriate measure to compare students’ performance with students who are currently learning under the same conditions. Moreover, norms consisting of peers with similar language educational experience can be compared to determine if all subgroups of children are performing as expected (Fuchs et al., 2004). This has the additional advantage of ensuring that all students with various backgrounds have access to appropriate services. The D/HH population, for example, is most
likely to be learning at a different rate than hearing students. However, frequent progress monitoring provides information to estimate the growth rates that most of these children are obtaining and how these rates can be improved.

Although the RTI approach is not currently well researched, promising results from several studies are beginning to emerge in the literature that supports the utility and accuracy of RTI assessment for identification of students with learning disabilities (VanDerHeyden et al. 2003; Fuchs, 2003). VanDerHeyden et al. (2003) examined the use of a standard RTI method to screen students for the presence of learning disabilities. The study utilized and compared several screening instruments to generate a list of students selected for further assessment of learning disabilities. As proposed by Fuchs (2003), this study utilized curriculum-based measurement (CBM) probes across a whole classroom to determine both the class mean performance and the individual child's performance. The students were compared to their own classroom's CBM achievement in determining whether they were at risk. Class mean, class trend, and national standards of performance were employed for comparison. To determine motivation problems, children whose scores were within frustration range and in the bottom 16% of the class were provided a reward if his/her score on the second administration of a CBM probe exceeded the score they obtained during the initial schoolwide screening. Children whose scores did not improve to the instructional range with incentive participated in a two to three week individual intervention. Finally, children whose performance did not improve to the instructional range with or without incentives were referred for an assessment and subsequent eligibility determination for special education services.

This comprehensive assessment and intervention process was used to establish a “gold standard” as to whether a child truly did or did not have a problem. Results of the study by
VanDerHeyden et al. (2003) demonstrated that identification based on lack of acceptable progress within the curriculum, with motivation strategies, and with brief intervention produced better identification of at-risk students in 406 cases than teacher referral and a screening test, Developmental Reading Assessment (DRA) (Beaver, 1997). Problem Validation Screening (PVS) correctly identified students in 87% of cases, compared to 66% agreement for teacher referral, 51% agreement for Comprehensive Inventory of Basic Skills-Revised (CIBS-R) (Brigance, 1998), and 68% for the DRA. Decisions based on progress monitoring data resulted in low numbers of false negatives as well as reasonable levels of false positives. Alternatively, teachers tended to identify many students who ultimately did not have a valid problem and miss students who had a valid problem. Further, teachers became much less accurate at identifying students who did and did not have a problem in both low-achieving and high-achieving classrooms, whereas progress monitoring results maintained or achieved even greater accuracy across contexts. CBM probes are an efficient method for screening taking only 45 minutes to administer, which teachers found to be generally acceptable. This is less time than required for other screening instruments used in this study (CIBS-R, DRA).

The data from this study would support the use of the student’s classroom as the unit of comparison when making referral decisions. Further, this method “proactively screens all the students in a school to identify students who may be at risk for serious learning problems, and results in more accurate identification relative to other commonly used identification methods”, specifically teacher referral (VanDerHeyden et al., 2003, p. 223).

RTI models have yet to be evaluated with D/HH populations. However, using RTI data as an assessment tool for the identification of LD students may be a promising option for the D/HH population since RTI focuses on how the student is responding to instruction as compared to
similar peers to determine the extent of a disability in a student. Intervention progress data allows for a better measure of a learning disability that may be causing low achievement within an effective curriculum for most D/HH children, rather than relying on the IQ-achievement discrepancy that is based on potentially invalid test results. Given the dual presence of learning disabilities and deafness in LD D/HH students, the assessment of such students may improve significantly when RTI is used to determine if it is either ineffective instruction or the learning disability causing low achievement scores. Because of invalid tests, the IQ-achievement discrepancy is less likely to differentiate from the two etiologies in LD D/HH students.

Allinder and Eccarius's study (1999), to date, is the only research study that is empirical in nature and includes the LD D/HH population with a RTI component: progress monitoring. These authors examined the utility of curriculum-based measurement (CBM) as a progress monitoring tool to evaluate progress in reading with D/HH students, and its reliability and validity using Manually Coded English (MCE) with students. With hearing populations, students are asked to read a reading passage out loud for one minute. The number of words that a student reads correctly per minute is then used to estimate reading performance. D/HH students were asked to read passages using sign language, which has different grammatical structures than the English language they are attempting to read. Thus, this study evaluated the impact of different grammar structure on reliability and validity of this measurement system as an estimate of reading performance. In this study, 36 students were administered CBM measures and Test of Early Reading Ability-Deaf and Hard of Hearing Version (TERA-D/HH) (Reid et al., 1991). The CBM measures employed five metrics such as number of words read, mean number of idea units retold, mean number of words retold, mean number of unique words retold, and percentage of content words retold. The findings showed that moderate reliability of CBM reading measures
for D/HH students who use MCE. When compared to other reading measures, CBM measures did not strongly correlate with the TERA-D/HH. The TERA-D/HH provides normative information, which is helpful for discriminating between LD and non-LD D/HH. These results indicate that there may not be one clear best way to monitor the reading progress of the D/HH students. After reviewing the results, the authors noted that progress monitoring of reading via CBM procedures is feasible, but it is time consuming. Although CBM might be used as a descriptive tool to generate goals and identify reading strategies when conducted monthly, the authors suggest that professionals should be cautious when using any reading assessment technique on D/HH students. The authors concluded that there is a need for feasible, reliable, and valid ways of monitoring reading progress. Clearly more work is required to develop accurate RTI tools for both assessment and ongoing monitoring of progress, not only for hearing students, but also particularly for the D/HH population.

RTI, in spite of its promise of improved identification of LD students, may have problems similar to IQ-achievement discrepancy evaluation. The field is still exploring what intervention assessment strategies will produce the most reliable results. There is a lack of research on what type or level of intensity intervention strategies are the most optimal yet efficient in preventing large achievement gaps and misidentification of students for special education services (Gresham & Witt, 1997). If practitioners of this method use a variety of assessment methods, RTI data may also result in unreliable diagnoses between school systems (Kavale et al., 2005).

In order for RTI to be effective, specific criteria need to be developed that accurately measure student growth in a number of keystone academic areas. A recent study by Fuchs et al. (2004) did a retrospective analysis with data from two reading intervention studies. For first
graders, the results indicated that a consistent method of measurement using slope median split on Dolch words could be used to discriminate between responsiveness and non-responsiveness to intervention on four reading end-of-year outcomes: (a) standard scores on the Woodcock Reading Mastery Tests (Word Identification and Word Attack), (b) spelling standard scores on the Wechsler Individual Achievement Test, (c) fluency, and (d) comprehension raw scores on the Comprehensive Reading Assessment Battery for first graders. The Dolch words slope measure most accurately judged instructional responsiveness as compared to nonsense word fluency, Woodcock Reading Mastery Tests word reading scores, and CBM benchmarks. For second graders, CBM slope median split differentiated the two groups on three of five outcome variables including: yearly growth and end-of-year outcomes on Word Identification and Word Attack standard scores on the Woodcock Reading Mastery Tests, spelling standard scores on the Wechsler Individual Achievement Test, and fluency and comprehension raw scores on the Comprehensive Reading Assessment Battery. This finding that different assessment methods distinguish different groups of responsive and non-responsive on different reading components is problematic. Thus, more research is needed to identify what assessment measures provide the most consistent and useful criteria for LD identification for different populations and grade levels.

A disadvantage of this methodology includes the difficult differentiation of growth in students who continue to perform successfully in the curriculum after a successful intensive instruction is faded from those students who do not profit from this approach when supports are removed (Fuchs et al., 2004). In a study by Vaughn & Fuchs (2003), second-grade students with reading disabilities were given 10 weeks of supplemental instruction. Those students that demonstrated growth based on a preset criterion continued to receive instruction in the general
education classroom. The other students in the group continued in the special instruction program. When the special instruction was discontinued, 75 percent of the students in that group failed to succeed when they were returned to the regular classroom. Thus, the accuracy with which intervention data predicts which child will remain successful when supports are removed has yet to be established.

Although a current shift towards research on the responsiveness to instruction intervention (RTI) model (Fletcher et al., 2004) may lead to a new LD definition that influences identification approaches, a newly developed process may not achieve accurate identification and services if D/HH students are not adequately included within the research that supports a new process. If the approach hypothesized by the RTI model were implemented for D/HH students with vast differences in language modes and potential effective interventions that accommodate these modes, it is expected that it would require some modifications and careful interpretations in order to be effective in the LD D/HH population.

Other Studies

Two additional studies that were found through the literature review provide some interesting information for consideration in respect to the identification of LD in D/HH students. In one of them, Stryker conducted a study “to quantify the clinical judgments of specialists in deaf education about the characteristic behaviors they perceive most effectively discriminate students who are D/HH with LD from those students without LD” (1998, p. 5). The results showed four component disabilities that best discriminate characteristics of LD: spatial relationship, visual perception, discrepancy between a student’s IQ and achievement level, and long-term memory. Together, these four constructs showed a .99 probability that LD is present.
when compared to the respondents' own memory and judgment about the students they serve who are suspected of or diagnosed as LD. There are some limitations of the study. One, this study did not examine the basis for specialists' decisions with regard to their reported percent estimate of the prevalence of LD. Two, this study did not examine the basis for specialists’ decisions with regard to their reported percent estimates of each component disability. And three, this study involved a relatively small number of specialists (64) serving as respondents.

Plapinger and Sikora (1990) conducted a case study of a nine-year old female who had obtained a moderate to severe LD classification. She had binaural amplification and expressed herself orally. An interdisciplinary approach was used in this study to describe an assessment procedure and to confirm the diagnosis of LD in the participant. The girl was evaluated for 20 days by a variety of school professionals. The professionals concluded that the girl has severe LD for four reasons: 1) she exhibited mild visual-perceptual deficits; 2) her visual and auditory processing skills were impaired; 3) her verbal skills were too low, given her moderate hearing loss and amplification; and 4) a discrepancy between her IQ score and achievement score was observed. The team agreed that her academic failure was caused by a combination of LD and her hearing disability. Interestingly, the team recommended a LD classroom rather than a deaf classroom for her educational placement because she had a family history that was highly correlated with learning problems. According to reports from the student’s current LD classroom teacher, the student has been described as a full participant who exhibited a desire to read and write, was showing substantial growth, and got along well with other children. Results from this case suggests that strategies used with other LD students helped this child make progress; however, clearly additional empirical support is needed to determine the extent that an interdisciplinary approach effectively provides professional and informed judgments about a
student’s academic capacities.

ADDRESSING CONFOUNDING VARIABLES IN IDENTIFYING LD D/HH STUDENTS

Confounding variables are present where the relationship between two variables are distorted or changed by the presence of a third or more variable(s). In other words, there might be an alternative explanation for the effects of one variable on the second variable measured. In the case of deafness and learning disabilities, there are several confounding variables that may influence interpretation of assessment scores that are used when assessing D/HH students who are suspected of LD. The review conducted for this paper yielded very few empirical studies that investigated confounding variables. For that reason, other articles which are not empirical in nature but propose potential confounding variables in the D/HH population will be discussed.

First, the influence of neurological conditions may potentially influence the interpretation of a test score. The neurological causes of LD, whether in D/HH or hearing individuals, cannot be reversed or changed, but they can serve a purpose to determine appropriate assessment strategies. Funderberg (1982) posited that professionals, with the knowledge of possible causes for the student’s LD, can then be better prepared to understand the effects of LD on classroom behavior.

Many etiologies for deafness are also causes of brain damage. Such conditions include: premature birth, meningitis, prenatal rubella, genetic syndromes, jaundice (including Rh factor complications), anoxia, several sexually transmitted diseases, and conditions cause by teratogenic medications (Morgan & Vernon, 1994; Mauk & Mauk, 1992; Mauk & Mauk, 1998). Ratner (1988) points out that because some D/HH children have etiologies that are similar to those with brain damage then it may be likely that D/HH children also have a high incidence of
learning disabilities. If a deaf child’s learning disability is not recognized as a separate, additional handicap, he/she will not receive the combined professional services that are necessary for his/her specific needs.

Second, the presence of multiple disabilities in a student can also lead to difficulties in determining which disability or disabilities influenced the assessment results. For example, dyslexia and a visual perceptual disability when concomitant in a student, would both affect the student’s academic performance, yet testing may not be able to discriminate between their relative affects. In testing a D/HH student with concomitant disabilities the confounding nature of these variables is only increased (Morgan & Vernon, 1994).

Third, the type of learning available for D/HH students, by itself, is a confounding variable. The norms developed by some test manufacturers for use with the D/HH population show a contrast to the norms for the hearing population. As stated earlier, the average reading level of 18-year-old deaf or hard of hearing students is between third and fourth grade (Holt, 1993). The use of pre-reading activities such as phonological awareness and mapping sounds to printed words that effectively increase the reading rates of hearing students are not an option or are limited with D/HH students (Goldin-Meadow & Mayberry, 2001). Learning to read by memorizing whole words with adequate exposure and practice is a primary instructional method for D/HH students (Cawthon, 2001). Yet, this method has been shown to slow the rate of reading progress in hearing students (Fielding-Barnsley, 1997). Additionally, many are learning to read in a language different than the sign language some D/HH children use for daily communication.

Fourth, language experience may be a confounding variable. D/HH students have fewer opportunities to learn and be exposed to language as hearing students, particularly students who are not socializing with others that sign. Inadequate or delayed exposure and practice in language
at an early age often results in severe delays in language and reading skill acquisition that require intensive interventions (Nelson et al., 1993). Because of this difference in language experience and its influence on learning and reading skill, the presence of a learning disability would be difficult to confirm by using norms derived from hearing populations. The conclusions from such norms may not be accurate or valid, causing a significant risk of language bias against the D/HH population. If professionals are to use norms, they should use norms based on the D/HH population for a valid comparison between non-LD and LD D/HH individuals.

Most tests used for identification of LD are also based on normal language acquisition. Tests that include verbal communication may need to be modified so that there is clear communication between the tester and the D/HH examinee. That may require the use of interpreters or other communicative aids for the D/HH student (Braden & Hannah, 1998; Gordon et al., 1996; Morgan & Vernon, 1994). Many assessment tools have verbal component(s) and may be biased against the D/HH student because the student may not know the vocabulary required to understand the instructions or the items utilized by the assessment tool (Morgan & Vernon, 1994). Because many tests only have hearing population norms, nonverbal tests with minimal language based requirements may be more appropriate than the language-based tests. Yet, these tests also may not adequately measure the same construct that testers may be attempting to measure because of several factors. First, tasks may be varied due to the nonverbal nature and thus may become a different construct than purports to be measured. Second, nonverbal test scores may not have the same meaning or predictions about performance in other areas outside the test itself as verbal tests might. For example, performance tests with minimal verbal requirements scores often used to measure intelligence are moderately correlated with academic achievement or occupational performance that these tests are attempting to predict.
These comparisons, however, correlate significantly greater with full-scale IQ scores that include both performance and verbal tasks.

Fifth, the presence or use of an interpreter alone can be a confounding variable during testing. Words or meanings can be altered or missed during translation. For example, some words in vocabulary sections of achievement and IQ tests have no equivalent in American Sign Language and have to be spelled out. Some learning disabilities present difficulty with spelling, and as such a D/HH student will struggle to perceive the fingerspelling accurately. Fingerspelling can also vary depending on the interpreter himself or herself, because different interpreters have different styles and different amounts of accuracy in forming the handshapes. The interpreter himself or herself may not know the correct spelling or meaning of a given vocabulary word. This emphasizes the importance of using an interpreter only with the appropriate level of state or national certification, and who is not a relative or close friend of the client. It is considered good practice to assist the interpreter in preparing for the test administration by outlining what to expect in the test process and even allowing him/her access to vocabulary lists ahead of time (Morgan & Vernon, 1994; Schick et al., 1999). In spite of these potential problems, as reviewed earlier, Sullivan and Montoya’s (1997) study indicated that the mode of communication (signed or oral) would have, if any, little effect on WISC-III testing results.

A sixth potential confounding determinant of test performance is the socio-cultural difference between a hearing professional and a D/HH student. Some professionals may be uncomfortable because they are not familiar with D/HH students and have little or no experience in communicating via an interpreter. When a D/HH student is uncomfortable with the process of interpretation, the outcome of their performance may be compromised. Furthermore, D/HH students who are members of the Deaf community may have a mistrust of hearing individuals,
particularly those in authority, due to a history of oppression. Finally, professionals may fail to recognize cultural differences that affect their diagnoses (Morgan & Vernon, 1994).

A seventh consideration that influences test score meaning when assessing D/HH students is tester bias. The tester may have little experience in working with the D/HH population. The tester may have acquired expectations from working with hearing students that may not be appropriate for the D/HH students. Cultural bias refers to situations where the tester may misunderstand or misinterpret the student’s socio-cultural life experiences. When cultural bias occurs, the results from the testing may be an inaccurate measure of the student’s competence. With the D/HH population, it is difficult to find testers who are knowledgeable about the culture of such students.

A confounding variable is present when a third condition interferes in the assessment of two other variables. Potentially, confounding variables may occur frequently in the D/HH population contributing to significant difficulties in establishing reliable and valid identification of LD. Moreover, the vast differences in hearing levels, health or medical complications, and social, language, and learning experience between D/HH students makes interpretation of test results even more difficult. However, little research has been conducted in this area to guide valid test selection or useful interpretation or utility of test scores that are used by school professionals to make important educational decisions for D/HH students.

**IMPLICATIONS FOR SCHOOL-BASED PRACTITIONERS**

A challenge for the future will be the determination of what combination of assessment measures will most reliably identify D/HH children with LD and help make progress towards the selection of effective instruction. Several noteworthy implications from this literature review
may guide best practices for school psychologists who work with D/HH students.

In the IDEA definition, learning disabilities have been defined, but within that definition, there are limitations of which school psychologists should be aware when working with the D/HH population. These limitations pose difficulties for school psychologists for several reasons. One, IDEA does not recognize the concomitant nature of learning disabilities within the D/HH population. School psychologists who have had not much experience with the D/HH population may not choose to assess those D/HH students who are suspected of LD because of this definition's restrictions. Nevertheless, it is a school team's role to investigate the possibility that the student may have multiple disabilities that may require specific educational support. Another possible difficulty would be that school psychologists may not know which disability would be the primary reason for academic failure. When selecting educational performance goals, it may be helpful to include goals that benefit both (or more) concomitant disabilities.

When a school psychologist receives a referral to evaluate D/HH students who are suspected of LD, there are a number of procedures that should be considered. It is important to collect and interpret collected data in a manner that can help evaluators distinguish between difficulties the D/HH students face in learning to function in a non-proficient language or different language from more permanent deficiencies that interfere with learning. Optimally, teacher and parent interviews, intervention progress review, class observations, academic and cognitive standardized and informal tests are conducted to determine if LD is contributing to low achievement. However, there are several additional steps that should be implemented when evaluating D/HH populations for LD. One of the greatest difficulties is to accurately assess the abilities and disabilities of one student when we do not have access to or are not familiar with expected norms for similar D/HH peers who are considered successful performers given their
Federal and state regulations do not provide adequate guidance for adapting procedures and practices used in making referral, assessment, and eligibility decisions involving culturally, linguistically, and economically diverse learners (MacMillan & Siperstein, 2002). Based on information derived from this literature review, there are some guidelines that can be proposed to school psychologists who are attempting to evaluate for LD with a D/HH student. Table 1 suggests steps to gather information about critical areas that support or deny the existence of a learning disability developed from the results of this literature review. These steps can be used to guide the complex data-gathering and help summarize multiple relevant data to facilitate decision-making for intervention and LD determinations in D/HH students with complex histories. To further illustrate this framework of practice derived from the literature, a brief case study will be presented.

Jay is a ten-year-old male student enrolled in fourth grade at Lakeview Elementary School. He has a 95 dB hearing loss in both ears. He was diagnosed at age two and received a cochlear implant at age three. He has always attended a self-contained classroom with other deaf and hard of hearing students with a teacher and aide who both sign. However, Jay reads at a first grade reading level whereas his classmates are at second or third grade reading level. In addition, he is below average in his ability to write and fingerspell words correctly. Jay’s teacher and mother are concerned about Jay’s reading abilities and both suspect he has a reading disability. Students such as Jay have experienced complex school, language, and social histories that may be accounting for academic difficulties rather than LD. Thus, interviews with family members and teachers can provide insightful information relating to academic difficulties. During an interview with Jay’s parents, it is important to query about factors that influence
performance. For example, students with few or inconsistent language opportunities or limited formal education tend to struggle academically. Always include parent information to determine differences between school and home environments (consider extent of acculturation, stress and medical factors, number of moves, use of language at home, attitudes about school and exceptionalities, and support). Parent literacy skills, education, and medical history also influence their ability to progress. Table 2 illustrates potential questions that can be used during teacher and parent interviews to obtain important information about a student.

For Jay, information from the parent and the teacher interview suggested that Jay has had early language developmental support. That is, both parents had been learning American Sign Language from the time of his birth. However, practice with signing has been limited to his teachers, parents and classmates. Although he is close with several of his classmates, he has had few interactions with peers outside of school situations. Jay has also been taught with teachers and parents that can sign fluently.

However, studies indicate that while this information is valuable, it is limited because parent and teacher observations are subjective, may conflict with one another, vary in reliability, and may neglect specific characteristics of LD in D/HH students. Thus school psychologists must not rely on teacher and parent observations alone. Additional assessments must be conducted.

As suggested in Table 2, the influence of learning acquisition in dual languages, English reading and American Sign Language, should also be examined. Because academics are influenced by the development of the primary language (ASL or English), the quality of conversation at home or with the interpreter in that primary language, and the establishment of the same said primary language in the preschool years, an assessment of language ability is
critical to distinguish the effect of language on poor achievement. For English language learners, best practice guidelines for assessing students from culturally and linguistically diverse backgrounds have been proposed (Gopaul-McNicol & Thomas-Presswood, 1998), and include testing in both the child's native and second language when appropriate. This is because students who are not fluent in either language have slower learning rates than students fluent in one or both languages. The same barriers logically apply for students who are learning sign language and learning to read English print. For Jay, the American Sign Language Proficiency Assessment (Maller et al., 1999) was used to assess Jay's ASL proficiency. Results showed Jay's proficiency rating at a moderate proficiency level. Moreover, Jay's teacher and interpreter are proficient at an advanced level. Other students in Jay's class sign proficiently, close to the level of their teacher and interpreter. This indicates that Jay is delayed in social language acquisition yet is on par to the level of language provided by adults within his learning environment.

For Jay, classroom observations provide an opportunity to gain knowledge about his current performance in several ways. First, an assessment can be conducted to evaluate the instructional environment to ensure that basic effective curriculum and instruction is in place for all children. Classroom observational studies indicate that there are specific teaching strategies that increase growth for all children, including English language learners (August & Hakuta, 1997; Turner and Meyer, 2000). For example, studies have demonstrated that specifying task outcomes and teaching students what they must do to accomplish tasks using demonstrations, providing frequent academic practice opportunities with immediate feedback, explaining ideas several times using multiple examples, frequently checking for comprehension, and monitoring students' progress effectively increase academic success (Emmer, 2001; Gettinger & Stoiber, 1999). If an effective curriculum and instructional components are in place, then schools
increase the likelihood that all children will learn. Consistent findings of low reading scores for D/HH students highlight the need to ensure that educational programs use well-developed systems that will promote and facilitate performance for most children and include early intervention for struggling learners.

The effects of classroom instruction can also frequently be evaluated. To do this, brief tasks, such as curriculum-based probes using sign language or mazes, can be conducted with Jay’s class or with children within the district in order to evaluate the progress of all peers in the curriculum. An example of results obtained for Jay from this type of universal screening procedures in reading are presented in Figure 1 to provide an illustration of the potential usefulness of universal screening procedures in reading with D/HH children. This figure displays the reading scores from a schoolwide screening that was administered in a fourth grade classroom in January. To facilitate decision making, the students’ scores are displayed from the lowest to highest reading scores. There are two types of standards that are shown on this graph: the district median of all students, and the D/HH district or state median. A review of the graph reveals that there are few children whose scores that fell substantially below the median score for students in fourth grade. Jay’s reading performance was then compared to classmates in order to determine the degree to which he was acquiring reading skills in English.

Next, Jay’s score was compared to other students of similar cultural and language background in the district to examine the influence of his hearing disability and learning a second language on reading performance. This type of data can be used to incorporate CBM district norms to examine achievement patterns in a district or statewide. Representation of students at the high, middle, and low levels of achievement scores should be proportional with the ethnic or D/HH composition in the district or in the state. If D/HH students historically make
the lowest achievement scores or students with LD are over-represented in special education, then the curriculum may need to be modified. This task with the D/HH population is much more daunting than with minority populations due to a small number of comparable students in the district or state that would adequately estimate expected performance rates. In contrast to norms obtained with larger hearing populations, a smaller population is likely to have a greater spread in the distribution of scores due to differences in school or district curriculum and teacher or interpreter language ability. Obtaining norms that define adequate and expected growth that applies to a group of children with a wide range of early childhood learning, language acquisition, and hearing ability will not be an easy task. For Jay, the D/HH median in Figure 1 consists of ten students who learned ASL as their primary language, speak ASL with parents at home, had cochlear implants as a child, and scored within a moderate ASL proficiency range on a proficiency test given at the beginning of the school year. Comparing his score to the median score of D/HH students shows that Jay’s score fell substantially below this median level. When Jay was given the performance/skill deficit evaluation to determine if incentives helped, there was no increase in his performance. These results suggest that Jay was exhibiting a skill deficit rather than a motivational deficit.

Numerous factors may still explain Jay’s lower progress. One potential explanation of his poor performance is that learning experiences within the classroom may have provided him with too few opportunities to practice skills needed for him to achieve. Or Jay may have been presented with an over-simplified curriculum without pertinent background knowledge. Because it is difficult to ascertain a student’s past learning history, a simple evaluation of Jay’s performance when given empirically supported instruction was conducted before concluding that Jay’s lower score is a reflection of his inability to learn. A child who has a disability would be
expected to be more “resistant” to intervention efforts than would a child who does not have a disability, thereby needing more intensive services. Figure 2 shows Jay’s performance during intervention. The data presented in this figure show the results obtained when Jay and two other students were given a small group reading intervention consisting of a review of key vocabulary followed by passage modeling and repeated reading practice. Given that his current progress in the classroom during intervention is sufficient, this helps to rule out the possibility of a severe learning disability and these data can be used to predict that he would not need additional services.

This case illustrates that a comparison of scores with a reference group that represents the child's linguistic and cultural community provided some evidence that further helps us to distinguish the difficulties D/HH students face in learning to function in a non-proficient language from more permanent deficiencies that interfere with learning. However, the ability to use tools that frequently monitor progress is limited with D/HH children. CBM, for example, is not as valid as with hearing populations, and there are limited curriculum/instructional strategies for all students, thus making it more difficult to differentiate between ineffective strategies and a disability.

Additional informal tests may also be of use to look at critical discrepancies that may explain low achievement problems and to determine if these gaps can be remediated as quickly as in other students without disabilities. Because these students are struggling with the double-demand of learning sign language and printed English, there is a variance in skills learned at the appropriate time or when presented within the curriculum. Using criterion-referenced tests may better help determine relevant discrepancies in skills that can be quickly remediated.

If Jay's performance was not progressing as expected given his background within an
effective curriculum and with intervention support, then standardized tests may be administered to better gauge academic and cognitive achievement ability. When using standardized tests to evaluate academic or cognitive ability, caution is again needed in selecting, administering, and reporting test results for a number of reasons. Most standardized tests have not been normed with the D/HH population, most D/HH students will need accommodation during administration (i.e., interpreters), and some standardized tests have a bias toward verbal skills. It is important to use normed tests as only one of many “anchors” in determining the extent of the problem.

Furthermore, standardized tests do not offer clear indications in identifying LD characteristics in D/HH students. Generally, it has been shown that it is difficult to determine if English proficiency is the problem (given that the test is administered in English) or if reading processing is the problem. Timed tests are also problematic for students who need additional time to process information between English print and sign language. Thus, the use of nonverbal tests may provide the best estimate of performance ability with certain skills although the scope of ability that can be assessed in this manner is limited. Moreover, scores obtained primarily based on performance tasks to estimate cognitive ability are limited due to a lower correlation with reading achievement; these tests are only a partial measurement of cognitive ability. Children who need additional reading assistance in general also have a low performance profile on these tests as well (Morgan & Vernon, 1994).

To summarize, the school psychology field can benefit from more research involving the D/HH population with measures that have appropriate validity specific to that population. Because a limited number of standardized tests provide normative data for the D/HH population, it is imperative that interdisciplinary teams use multiple assessments with less reliance on teacher referral alone. Standardized testing can provide more detailed information about the disabilities.
However, because of differences in timed tests, language use, and type of cognitive ability being assessed, more than one intelligence assessment tool, including a non-verbal test, may be needed. Moreover, the literature does not consistently support the discrepancy model as a means of identifying LD within the D/HH population. Lastly, school psychologists should be wary of limitations in score interpretations; these should be documented. In general, experts and studies show that there are substantial differences in language and educational experience that impact test scores, and in testing procedures due to different language modes and use of interpreters.

The results of this paper propose that to identify learning disabilities in the D/HH population, it is best practice to determine if a learning disability is contributing to poor performance with D/HH students only after a battery of procedures with the child and within the child’s environment have been utilized. When testing, testers should attempt to minimize most variables in order to reduce the effect of confounding variables and obtain more accurate results. Nevertheless, confounding variables are an inevitable part of assessing a D/HH student, particularly when the student also has LD.

Clearly, identifying the presence of LD in order to determine relevant special education services that address this disability is not a simple task for education professionals. Until additional research has been conducted that indicates valid procedures that accurately identify the existence of a learning disability, it is critical that school psychologists use a variety of procedures that can be utilized to identify children who are at-risk and need early intervention services to help prevent severe academic difficulties. There is evidence that early identification of low achievement with early intervention services can decrease the likelihood of academic failure and increase long-term functional skills (Donovan & Cross, 2002). Early intervention is also needed to prevent the huge achievement gap between D/HH and hearing populations. The
anticipated benefit to this approach is to provide a framework that will potentially enhance child performance and provide information about what works best for these children. Once we have developed effective programs, then we can more accurately determine when low achievement is due to a disability rather due to cultural, language, or educational disadvantages.
Table 1

Gathering of information about critical factors of academic performance for D/HH students

Parent Interview

Language experiences:
1. At what age did the child start expressing himself/herself verbally (speaking or signing)?
2. Did he/she pick it up quickly?
3. Number of years instructed in written or conceptual English
4. Which language works best when explaining things to your child?
5. Which language does your child express wants, needs, and feelings best?
6. How well does your child understand speakers in your native language?
7. Which language does the child use when speaking to other children?
8. Which language works best when explaining things to child?
9. In which language does child express wants, needs, and feelings best?

Educational support:
10. What type of special help or services has your child received? Consistent services?
11. Did the child go to preschool?
12. Describe any academic concerns.

Social language and learning experiences:
13. How often does your child interact socially with other D/HH children?
14. How often does he/she socialize with hearing children?

Teacher Interview

Educational and behavioral experiences:
1. What are some concerns related to this student?
2. What are the student’s grades?
3. What is his/her attendance record?
4. Explain your expectations for the student’s performance.
5. Describe the student’s strengths and weaknesses.
6. Explain any discrepancies between his/her schoolwork and abilities.
7. Give results of interventions already attempted.

Language experiences:
8. Describe the student's use of his/her native language and/or the English language.
9. Describe the student’s socialization with his/her peers.
Language Assessment to estimate native language proficiency:

1. Conduct informal assessment describing level of basic skills functioning in both languages:
   a. Whether the child understands teacher-talk (e.g., tests of dictation or story retelling)
   b. Whether the child can handle the language found in texts (e.g., Cloze procedures or comprehension checks)
2. Collect information about transition to English language instruction and how child was functioning in the native language at the time of the transition.
3. Compare language ability, transition time and when basic skills were taught to see if low achievement may be language based.

Assessment of interpreter’s influence on performance:

1. Is proficient in your language and the child’s (check dialect).
2. Possesses the appropriate level of vocabulary and skills for the testing situation; including knowledge of basic content area being tested (may need to train).
3. Is aware of cultural rules governing interactions in order to help bridge the cultural gap.
4. Realizes how information may get lost in the interpretation process.
## Table 2
Troubleshooter for Academic Difficulties with D/HH students

<table>
<thead>
<tr>
<th>LEVEL 1: Troubleshoot Instruction and Curriculum</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Is the child attending school regularly?</td>
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<td>Are most students performing as expected (e.g., on DIBELS oral reading fluency)?</td>
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<tr>
<td>Is the child performing above general education students on CBM maze?</td>
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<tr>
<td>Are few D/HH students performing below median D/HH score on maze? Or are the number of low, middle, and high within expected proportions of the current D/HH population?</td>
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<tr>
<td>Is child performing at or above median score of D/HH students?</td>
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<tr>
<td>Is child performing above peers when provided with incentives to increase score?</td>
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<td>Is child performing above peers with most similar educational, language, and hearing impairment experiences?</td>
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<tr>
<td>Are academic skills taught appropriately (clear directions, guided practice, frequent opportunities to respond, and feedback)?</td>
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<td>Was an intervention goal (2 words increase per week) met?</td>
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<td>Was a modified more intense intervention goal (2 words increase per week) met?</td>
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### Summary
If yes is marked in all rows, then the child is responding within an effective curriculum. If the data indicates that the student is not making adequate progress toward performance goals, then proceed to Level 2 to ascertain interfering classwide behavior problems.

<table>
<thead>
<tr>
<th>LEVEL 2: Troubleshoot Classroom Management Fundamentals</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Are positive behavioral expectations are taught and managed appropriately?</td>
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<td>When observed, is the overall student appropriate behavior greater than 70%?</td>
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<td>Is there evidence of a systematic plan for addressing non-compliance and compliance with classroom rules (e.g., posted plan, training, and student knowledge)?</td>
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<td>Are rule violations enforced according to behavior plan 100% of the time?</td>
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<tr>
<td>Do students transition between activities in less than 4 minutes?</td>
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<tr>
<td>Is child's appropriate behavior greater than 70%?</td>
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</table>

### Summary
If yes is marked in all rows, then the child is responding within an orderly classroom. If the data continues to indicate that the student is not making adequate progress toward performance goals and is exhibiting behavior problems, then proceed to Level 3 to ascertain interfering behavior problems.

<table>
<thead>
<tr>
<th>LEVEL 3: Troubleshoot Behavioral Intervention Design</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Was a functional assessment conducted to identify variables including functional communication and social skills associated with problem and positive behaviors?</td>
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<td>Was the student trained to perform a replacement behavior?</td>
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<td>Are antecedents for the replacement behavior salient to teachers and students?</td>
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<td>Is the intervention implemented in an environment that predictably produces the programmed consequence?</td>
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<tr>
<td>When the replacement behavior is used, does the preferred consequence occur frequently, immediately, and for a reasonable amount of time?</td>
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<td>Is the student receiving regular opportunities for positive responding with feedback and reinforcement?</td>
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<tr>
<td>When problem behaviors occur, does the preferred consequence infrequently occur or not at all?</td>
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### Summary
If yes is marked in all rows, then the child is responding to an effective instructional and/or behavioral intervention. If the data indicates that the student is continuing not to make adequate progress toward performance goals, then proceed to Level 4 to further ascertain a learning disability.
<table>
<thead>
<tr>
<th>LEVEL 4: Conduct assessment to further confirm or disconfirm a learning disability</th>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>Is primary language proficient?</td>
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<tr>
<td>Is language level typical or similar to relevant peers with similar history of language acquisition and instruction?</td>
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<td>Are language opportunities at home adequate?</td>
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<tr>
<td>Are language opportunities at school adequate?</td>
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<tr>
<td>Are social learning opportunities adequate?</td>
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<td>Are internal behavior difficulties not interfering with academic performance?</td>
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<td>Is the child's interpreter's ability possesses the appropriate level of vocabulary and skills for the classroom instruction and expectations including knowledge of basic content area being tested?</td>
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<tr>
<td>Is the child's interpreter aware of cultural rules governing interactions in order to help bridge the cultural gap and realizes how information may get lost in the interpretation process?</td>
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<tr>
<td>Are achievement test scores typical for his or her age and D/HH students?</td>
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<tr>
<td>Are cognitive test scores typical for his or her age and D/HH students?</td>
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<tr>
<td>Are adaptive test scores typical for his or her age and D/HH students?</td>
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</table>
Figure 1: The results from a classwide assessment in reading shows that Jay scored below the class and the D/HH median in reading. The problem did not improve with incentives so it is considered a skill deficit problem.
Figure 2: With implementation of a 12 minute brief intervention, Jay’s scores improved at a faster rate than his D/H/H peers and consistently above the aim line (increase of 2 words per week).
APPENDIX

Characteristics of studies examining the effect of assessment options for learning disabilities for Deaf and Hard of Hearing children experiencing reading difficulties

Table 1: Research Summary of Empirical Studies

<table>
<thead>
<tr>
<th>Author &amp; Year</th>
<th>Purpose of Study</th>
<th>Population</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Design/Method</th>
<th>Findings</th>
<th>Summary/Implications for Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berent, Samar, &amp; Parasnis (2000)</td>
<td>“To identify specific English language phenomena on which deaf students with and without LD might show significant differences in their respective knowledge.”</td>
<td>36 faculty and staff members at National Technical Institute for the Deaf (NTID) - a college for deaf students; 28 responded</td>
<td>N/A</td>
<td>N/A</td>
<td>30 item survey to “uncover any unusual English language characteristics that might distinguish an LD deaf student from a non-LD deaf student”; statistical tests and Bonferroni criterion</td>
<td>Spelling/Deficits in phonological awareness rated #1 characteristic differentiating between LD and non-LD deaf; discourse and lexical processes are important as well; other items have moderate agreement; “functional category use is central to LD”; LD in D/HH could have an heterogenous collection of disorders</td>
<td>Professionals who work with D/HH populations can provide close and similar characteristics that signify LD that are consistent with previous empirical findings about hearing LD students.</td>
</tr>
<tr>
<td>Authors</td>
<td>Study Details</td>
<td>Key Findings</td>
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<tr>
<td>Powers, Elliott, Fairbank, &amp; Monaghan (1988)</td>
<td>To compare factors of language, sign language, speech, learning disability, and behavior ratings for a selected group of D/HH; investigate the extent to which various school personnel ratings and scores from instruments that purport to measure learning and behavior problems agree. All of the 5-12 years old students in a Deaf residential school – 69 total students; only 27 students selected – I.Q. mean score was 95.8 – severe to profound hearing loss.</td>
<td>Initially 25% were rated as LD by one or more raters; 11% rated with behavior problems; teacher more commonly rated presence of LD or behavior problems; 2nd rating – 3 were rated as LD or 11%; many unanswered questions remain as to how to identify LD; LD D/HH had language effectiveness ratings below the mean; behavior problems had language effectiveness ratings that were not below the mean. Differences in language abilities maybe a differentiating criteria between LD H/HH and non-LD D/HH; discrepancy in achievement compared to potential is a poor distinguishing characteristic; behavior may be an indication of LD; teachers are more likely to rate a student having LD; teachers most likely to identify a LD student.</td>
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<tr>
<td>Elliot, Powers, &amp; Funderburg (1988)</td>
<td>To determine methods of identifying and assessing, and programming procedures used with LD D/HH; to collect information from administrators and teachers about LD and characteristics in D/HH</td>
<td>754 final, responsive returned surveys – represented 7,594 D/HH K-12 students – 1,748 had another disability</td>
<td>N/A</td>
<td>N/A</td>
<td>15-item survey sent to 1,355 professionals asking questions about LD in their students; 754 were returned with responses</td>
<td>23% of all D/HH students in programs were LD; teachers’ criteria for LD: presence of processing and memory problems; administrators’: discrepancy between IQ and achievement scores; 2nd criteria for both: visual-perceptual problems; most used method of identifying LD in D/HH: teacher observation and referral; most teachers have little LD training – there is a lack of support services; WISC-R and Bender Visual Motor Gestalt Test were used in more than 5% of cases; most used instructional strategy: individualization of instruction</td>
<td>More study is needed for incidence, behaviors, and criteria for LD; better assessment measures and teaching strategies are needed; and an accepted definition and criteria for LD would be helpful</td>
</tr>
<tr>
<td>Powers, Elliott, &amp; Funderburg (1987)</td>
<td>To determine the status of D/HH students with LD as well as incidence, identification, and assessment of LD; to learn about educational programming and the characteristic behaviors of LD D/HH students</td>
<td>105 directors of D/HH students – public residential schools – largest program in each state</td>
<td>N/A</td>
<td>N/A</td>
<td>11-item survey mailed to directors of programs; 60% returned</td>
<td>6.7% of all D/HH had LD; 3.6% preschool LD, 6.5% elementary LD, 8.0% junior high LD, 6.9% high school LD; LD is described as academic problems; various methods of identification - 1) teacher observation, 2) diagnostic assessment, 3) diagnostic observation, 4) administrator and parent observation, 5) formal test battery - considerable variations in tests utilized; LD criteria - discrepancy between I.Q. and achievement; LD characteristics - achievement discrepancy, perceptual problems, and behavior problems; lack of criteria to define LD D/HH; little agreement on how LD/DHH students are identified</td>
<td>No recommendations; lack of criteria for identification; limited resources for assessment</td>
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<tr>
<td><strong>Sikora &amp; Plapinger (1997)</strong></td>
<td><strong>To determine differences between parents and teachers in assessing (informally) students' cognitive and academic strengths and weaknesses</strong></td>
<td><strong>19 students – 14 males, 5 females, age 7-13 years, mean 10 years; 14 mild to moderate hearing loss, 1 profound, 2 unilateral, and 1 conductive; sample were earlier used in a 1994 study</strong></td>
<td><strong>N/A</strong></td>
<td><strong>Parents and teachers filled out a multiple-choice questionnaire to quantitatively rate: audiological status, educational setting, cognitive and communication characteristics and academic performance; ratings compared with performance on WJ-R, Test of Visual Perceptual Skills, Wide Range Assessment of Memory and Learning, Developmental Test of Visual Motor Integration; correlation coefficients were computed</strong></td>
<td><strong>In academics, all correlation were statistically significant ranging from between .59 to .89; in areas of visual processing, memory, and organization, there were no significant correlations</strong></td>
<td><strong>The strong correlation in academic perceptions and performance is probably due to the high rate of communication between teachers and parents of special-needs children – in contrast, teachers and parents are less accurate in perceptions of students' processing difficulties; increased awareness is needed for parents and educators trying to identify processing problems in D/HH students; encourage thorough psychoeducational evaluations; more appropriate educational programs may be established; a parent or teacher alone may misdiagnose or overlook a student's problem</strong></td>
<td></td>
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<tr>
<td>Author</td>
<td>Study Description</td>
<td>Methodology</td>
<td>Findings</td>
<td>Recommendations</td>
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<tr>
<td>Jaussi (1985)</td>
<td>“To compare the definitions of learning disability, processes for identifying learning disabled students, and educational procedures followed as delineated in PL 94-142 with the definitions, processes, and procedures used by residential deaf schools in the United States enrolling deaf, learning disabled students.”</td>
<td>Administrators from 31 residential deaf schools responded to the survey; 36 teachers from nine schools responded; included definitions for learning disabled, residential deaf school, “normal” deaf students, PL 94-142, multidisciplinary evaluation team.</td>
<td>A descriptive survey and a Likert survey were given to administrators and teachers, asking about whether there are definitions, procedures, and formal processes for LDD students; results from administrators were compared with teachers’ and with the information contained in PL 94-142.</td>
<td>1. Personnel were not in agreement about definition of LDD in their institutions; 2. LD classification seems to have been done without a consistent, formal process, frustrating teachers; 3. Some programs as touted for LDD were more applicable to multihandicapped deaf; 4. Consensus was lacking between administrators and teachers about definitions, formal procedures, and programs for LDD; 5. Teachers appeared not to be communicating with each other.</td>
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“First, a more concise definition of learning disability needs to be articulated by the administrators of the residential schools. Secondly, teachers need to have specific training in providing a variety of appropriate educational programs for students who are classified as deaf, learning disabled. Educators, in general, need to reduce the tendency to group students into a general category of multihandicapped and begin to identify and isolate educational programs for individual students.”
<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Methodology</th>
<th>Findings</th>
<th>Conclusion</th>
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<tbody>
<tr>
<td>Sikora &amp; Plapinger (1994)</td>
<td>Evaluate the use of standardized psycho-educational diagnostic instruments to identify learning disabilities in D/HH and to differentiate between non-LD and LD D/HH students</td>
<td>A series of standardized psycho-educational tests that are well accepted in the diagnosis of LD in the hearing population were administered; Audiological, speech and language, psychological, psycho-educational, and occupational therapy measures were given; there was no statistical analysis</td>
<td>LD in D/HH students is identified with a frequency similar to the hearing population; 12 students had normal cognitive and achievement scores; 2 students – LD; 3 other students were controls; LD D/HH scored lower in WISC-III Information, Similarities, Vocabulary and Comprehension subtests – LD D/HH had discrepancy between Verbal and Performance scales; linguistic measures – lower scores; visual-perceptual measures – all groups (but retarded) were similar; academic measures – LD D/HH below average and had more problems with reading, decoding, and comprehension</td>
<td>D/HH can perform both academically and linguistically on par with their hearing peers; Language based areas are more difficult for LD D/HH; test protocols can differentiate between non-LD and LD D/HH</td>
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**Note:** The table entries are interpreted from the provided text.
| Sullivan & Montoya (1997) | Administer WISC-III to D/HH and examine factor structure, age, gender, degree of deafness, etiology, communication mode, administration mode, and placement were assessed | 106 D/HH children – 61 boys and 45 girls; all had a 45 DB or greater in better ear; 6 to 16 years old; ASL – 38%, Signed English – 34%, oral – 28%; 60% mainstreamed, 40% residential | Factors unique to D/HH population | D/HH children’s intelligence | 1) Factor analysis; 2) Administration of WISC-III to all of the participants according to preferred communication mode; 3) t tests were used to investigate differences | Two factors were found to be influential – language comprehension and visual-spatial organization; children with known etiologies score higher than those with unknown etiologies, which is consistent with CNS damage; there were no differences in scores when administered differently as far as following standardized procedures | IQ tests can be administered with little difficulty; preferred mode of communication is important to use in testing; interpreters have little, if any, effect on scores |
| Traxler (2000) | To find out if the D/HH norms developed by Gallaudet Research Institute (GRI) can work for Stanford Achievement Test 9 (SAT-9) and if the Performance Standards (PS) will help with information about students | 4808 students – 8 to 18 years old, the PS sample – not random and most came from the 4808 students; 54% White, 18% Black, 19% Hispanic; 28% less than severe hearing loss, 21% severe, 51% profound; 8% had additional physical disability, 24% had additional cognitive disability; the samples are representative of the country | Scores and norms from the D/HH norming sample and the PS sample | Hearing norms and scores for SAT-9 | Scaled scores for the D/HH were examined to provide context for individual scores; six subtests were used; scores from PS sample were compared with hearing sample | Professionals can use the norms developed by GRI to give SAT-9 scores meaningful and comparable with hearing students’ scores; grade equivalent scores can be obtained for D/HH; Performance Standards can be used to compare with hearing students | Scores from the GRI norms can be interpreted correctly for the D/HH population |
| Stryker (1998) | “To determine the efficacy of applying Bayesian revision of subjective probabilities to quantify the clinical judgments of specialists in deaf education about the characteristic behaviors they perceive most effectively discriminate students who are D/HH with LD from those students without LD.” | 33 specialists who work with the D/HH population, from locations (Missouri, Tennessee, Washington, D.C., and elsewhere) and responded to the survey; specialists had a decade or more of experience. | N/A | N/A | Specialists were asked to “indicate (a) the percentage of students who are D/HH with LD exhibiting each of the 32 component disabilities and (b) the percentage of students who are D/HH without LD exhibiting these same component disabilities on the questionnaire.” They were then asked to estimate the percent of students who are D/HH who they also perceived as being LD. | Results show four component disabilities were best discriminating – spatial relationship, visual perception, discrepancy between a student’s IQ and achievement level, and long-term memory. These four together show a .99 probability that LD is present. | Limitations of the study – 1. This study did not examine the basis for specialists’ decisions with regard to their reported percent estimate of the prevalence of LD; 2. This study did not examine the basis for specialists’ decisions with regard to their reported percent estimates of each component disability; 3. This study involved a relatively small number of specialists (N=64) serving as respondents – recommendations: use the four discriminating characteristic behaviors for screening LD D/HH. |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RTI Studies | | | | | | | | |

<p>| <strong>Stryker (1998)</strong> | <strong>33 specialists who work with the D/HH population, from locations (Missouri, Tennessee, Washington, D.C., and elsewhere) and responded to the survey; specialists had a decade or more of experience.</strong> | <strong>N/A</strong> | <strong>N/A</strong> | <strong>Specialists were asked to “indicate (a) the percentage of students who are D/HH with LD exhibiting each of the 32 component disabilities and (b) the percentage of students who are D/HH without LD exhibiting these same component disabilities on the questionnaire.” They were then asked to estimate the percent of students who are D/HH who they also perceived as being LD.</strong> | <strong>Results show four component disabilities were best discriminating – spatial relationship, visual perception, discrepancy between a student’s IQ and achievement level, and long-term memory. These four together show a .99 probability that LD is present.</strong> | <strong>Limitations of the study – 1. This study did not examine the basis for specialists’ decisions with regard to their reported percent estimate of the prevalence of LD; 2. This study did not examine the basis for specialists’ decisions with regard to their reported percent estimates of each component disability; 3. This study involved a relatively small number of specialists (N=64) serving as respondents – recommendations: use the four discriminating characteristic behaviors for screening LD D/HH.</strong> |
| Allinder &amp; Eccarius (1999) | Examine the utility of curriculum based assessment with D/HH students, and its reliability and validity with Manually Coded English (MCE) students; examine the impact of grammar structures had on reliability and validity of this measurement system | 36 elementary students; median age – 10.5 (6 to 13); all are prelingually deaf – 75% profound, 8% moderate, 11% severe, 6% severe to profound, 11% progressive loss; 56% boys, 44% girls; 92% minority students; used MCE in classroom | 1) number of words read, 2) mean number of idea units retold; 3) mean number of words retold – unique words and content words | Rate and accuracy of reading in D/HH | 1) Administered Test of Early Reading Ability-Deaf and Hard of Hearing Version (TERA-D/HH); 2) Administered CBM by 5 measures derived from two passages of the Comprehensive Reading Assessment Battery (CRAB) – read two passages; 3) Retell the passages in their own words; 4) Students were videotaped in order to score the passages | 1) Qualified support for the reliability of CBM reading measures for D/HH students who use MCE; 2) Validity of CBM measures not as strong; 3) There may not be one clear best way to monitor the reading progress of D/HH; 4) TERA-D/HH provides normative information – CBM provides opportunities for teachers to observe how students interact with different types of print; 5) Poor performance on the retellings | 1) Progress monitoring of reading via CBM procedures is doable, but time consuming; 2) CBM might be used as a descriptive tool to generate goals and identify reading strategies when conducted once a month; 3) Great care is to be taken when using any reading assessment technique on D/HH; 4) Need feasible, reliable, and valid ways of monitoring reading progress |</p>
<table>
<thead>
<tr>
<th>Plapinger &amp; Sikora (1990)</th>
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<tr>
<td><strong>To describe an assessment procedure; utilizes an interdisciplinary approach; emphasizes perceptual processing and memory skills</strong></td>
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<tr>
<td><strong>Case study; nine-year-old female; moderate to severe classification; identified at 3.10 years of age; binaural amplification; oral-auditory communication mode</strong></td>
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<tr>
<td><strong>Presence of a disability; specifically LD</strong></td>
</tr>
<tr>
<td><strong>Scores from various assessment tools</strong></td>
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<tr>
<td><strong>Child attends diagnostic classroom for 20 days; evaluated by: pediatrician, audiologist, psychologist, speech-language pathologist, special educator, physical and occupational therapist; observed informally with peers; interdisciplinary meeting</strong></td>
</tr>
<tr>
<td><strong>Participant has severe LD for four reasons: 1) mild visual-perceptual deficits; 2) visual and auditory processing skills were impaired; 3) verbal skills were low given her moderate hearing loss and amplification; 4) discrepancy between IQ score and achievement score; team agreed academic failure was caused by a combination of verbal and visual LD, and hearing disability; team recommended LD classroom rather than deaf classroom; family history highly correlated with learning problems; positive peer and family interactions increases possible LD—if poor interactions, possible EBD</strong></td>
</tr>
<tr>
<td><strong>Team members provide useful information about their student; consider severity of hearing disability and amplification level; multiple measures of same skill provide better reliability and validity, plus teacher input is helpful; inter-evaluation reliability is “crucial in determining whether a hearing-impaired child’s academic failure is related to the hearing loss or to a learning disability.”</strong></td>
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Table 2: List of Recommended Battery of Measures for Identification of LD in D/HH Population

<table>
<thead>
<tr>
<th>Measure</th>
<th>Purpose</th>
<th>Concerns/Comments</th>
<th>Deaf Norms</th>
<th>Ages</th>
<th>Authors Supporting This Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wechsler Intelligence Scale for Children (3rd Ed.) (Performance Scale) (WISC-III)</td>
<td>Measures intellectual functioning – good for identifying which areas are strengths and weaknesses</td>
<td>This measure should paired with another measure of intellectual functioning; strong reliability and validity; some psychologists recommend using all six subtests</td>
<td>None</td>
<td>6-16</td>
<td>Morgan &amp; Vernon, 1994</td>
</tr>
<tr>
<td>Universal Nonverbal Intelligence Test (UNIT) (1998)</td>
<td>Measures intellectual functioning – good for identifying which areas are strengths and weaknesses</td>
<td>Small sample size; reliability in the 80s; lack of verbal items and standardization make this test ideal; lack of language component might be a weakness</td>
<td>Sample included D/HH participants</td>
<td>5-17</td>
<td>Krivitski et al (2004); Maller (2000)</td>
</tr>
<tr>
<td>Stanford Achievement Test (9th Ed.) (2004)</td>
<td>Measures educational achievement from grades 1 to 9</td>
<td>Has been normed with D/HH participants; special directions can be provided for D/HH test takers; nine subtests have not been normed because they are curriculum-dependent, use auditory means, or not all test levels are supported.</td>
<td>Yes – obtain special norms from Gallaudet Research Institute</td>
<td>Grades 1-9</td>
<td>Traxler (2000)</td>
</tr>
<tr>
<td>Test Description</td>
<td>Description</td>
<td>Normed/Validated</td>
<td>Test Time</td>
<td>Degree of User Accessibility</td>
<td>Ref.</td>
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<tr>
<td>AAMD Adaptive Behavior Scale (1974)</td>
<td>Measures adaptive behavior functioning</td>
<td>Standardized; norms include intellectually disabled students, nonretarded students, and special education students</td>
<td>No</td>
<td>3-69</td>
<td>Morgan &amp; Vernon (1994)</td>
</tr>
<tr>
<td>Vision Screening</td>
<td>Tests visual acuity and spatial and depth relationships</td>
<td>None</td>
<td>N/A</td>
<td>All</td>
<td>Morgan &amp; Vernon (1994)</td>
</tr>
<tr>
<td>Audiological Evaluation</td>
<td>Identify level of deafness and possible neurological damage</td>
<td>Helps to know the extent of student's hearing disability; certified audiologist recommended</td>
<td>N/A</td>
<td>All</td>
<td>Morgan &amp; Vernon (1994)</td>
</tr>
</tbody>
</table>
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