

Journal of Educational Audiology: Ten Years in Review

Erin C. Schafer, Ph.D.

University of North Texas
Denton, Texas

Cynthia M. Richburg, Ph.D.

Indiana University of Pennsylvania
Indiana, Pennsylvania

Andrew B. John, Ph.D.

University of Oklahoma Health Sciences Center
Oklahoma City, Oklahoma

Karen L. Anderson, Ph.D.

Pediatric & Educational Audiology Consulting
Minneapolis, Minnesota

Susan Naeve-Velguth, Ph.D.

Central Michigan University
Mt. Pleasant, Michigan

Claudia D.L. Updike, Ph.D.

Ball State University
Muncie, Indiana

This article is a showcase of titles and abstracts seen in the *Journal of Educational Audiology* over the past ten years (2000-2009). The purpose of this compilation is to illustrate the diversity of article topics. In addition, this article documents some of the changes in technology, theories, and implementation of therapies/protocols over the past decade.

Introduction

Over the past ten years, publications in the *Journal of Educational Audiology* provided a wealth of information related to management, testing, counseling, and amplification of children who have normal hearing, hearing loss, or other auditory disorders. To provide the journal readership with an overview of these informative papers, the Journal Committee has compiled a table of publications sorted by topic and provided reprints of the abstracts from manuscripts published from 2000 to 2009. Articles may be listed more than once in the table because many publications related to more than one topic in educational audiology (e.g., FM systems and auditory processing disorders). The Journal Committee hopes this information will be helpful to educational audiologists and other professionals who serve and conduct research with children who have normal hearing, hearing loss, or other auditory disorders.

2000 - Volume 8

◆Adolescents' Attitudes toward Their Peers with Hearing Impairments (Stein, Gill, & Gans)

A questionnaire was distributed to 80 adolescents with normal

hearing to determine whether gender and/or the presence of a classmate with a hearing impairment affected attitudes toward socialization with, appearance of, and achievement of peers with hearing impairments. While some negative attitudes continue to exist toward those with hearing impairments, the degree of negativity appears to have decreased compared to some studies conducted in the 1980's. These results suggest that educational programs should be continued to be implemented in the homes and at school to further improve acceptance of children with hearing impairments.

◆Current Practices in Classroom Sound Field FM Amplification (Crandell & Smaldino)

It has been amply demonstrated that sound field FM amplification, or sound reinforcement, systems can improve speech perception, reading/spelling ability, behavior, attention, psychosocial function, on-task behaviors, and psychoeducational achievement in children. To date, however, there exists a paucity of empirical data on the clinical practices of audiologists in recommending, dispensing, installing, and measuring the efficacy of such technology. The purpose of the present investigation was

Table 1. Overview of 2000 to 2009 Journal of Educational Audiology Articles Sorted by Topic

Topic	Author(s)	Year	Issue	Title
Auditory Processing Disorder & Auditory Neuropathy/Dys-synchrony	English	2001	9	Assessing auditory processing problems in the school setting
	Blumsack	2001	9	Auditory processing assessment in children: Towards a dual approach
	Keith	2002	10	Standardization of the Time Compressed Sentence Test
	Garfinkel	2003	11	Educational testing for auditory processing: A retrospective study
	Friederichs & Friederichs	2005	12	Electrophysiologic and psycho-acoustic findings following one-year application of a personal ear-level FM device in children with attention deficit and suspected central auditory processing disorder
	Gustafson & Keith	2005	12	Relationship of auditory processing categories as determined by the Staggered Spondaic Word Test (SSW) to speech-language and other auditory processing test results
	Plyler et al	2005	12	Auditory neuropathy/dys-synchrony with secondary loss of otoacoustic emissions in a child with autism
	Urdike	2006	13	The use of FM systems for children with attention deficit disorder
	Hurley et al	2007-08	14	Click ABR characteristics in children with temporal processing deficits
Behavioral/Speech Measures	Strange et al	2009	15	Exploring the usefulness of Fisher's Auditory Problems Checklist as a screening tool in relationship to the Buffalo Model Diagnostic Central Auditory Processing Test Battery
	Kuk & Ludvigsen	2001	9	Verification of nonlinear hearing aids: Considerations for sound-field thresholds and real-ear measurements
	English	2001	9	Assessing auditory processing problems in the school setting
	Stewart	2003	11	The Word Intelligibility by Picture Identification Test: A two-part study of familiarity and use
	Naeve-Velguth et al	2005	12	Child distress and the use of a teddy bear model during preschool audiologic screenings
	Gustafson & Keith	2005	12	Relationship of auditory processing categories as determined by the Staggered Spondaic Word Test (SSW) to speech-language and other auditory processing test results
	Prendergast	2005	12	Use of the California Consonant Test with children
	Freyaldenhoven & Smiley	2006	13	Acceptance of background noise in children with normal hearing
	Cienkowski et al	2009	15	The Word Intelligibility by Picture Identification (WIPI) Test revisited

to examine current practices among audiologists regarding sound field FM technology. Specifically, a 20-item questionnaire was sent to 916 audiologists. Responses were received from 241 audiologists for a return rate of 26%. Theoretical and applied applications of the survey results are discussed.

◆A Cross-Case Study of Audiologic Services Delivered to Students in Four Different Demographic Settings (Byrne, Cordell, & Lehnerer)

A negative outcome of the decentralization of students who are deaf or hard of hearing may be the unavailability of school personnel knowledgeable about the maintenance of amplification devices and the provision of appropriate Audiologic services in school settings. The purpose of this study was twofold: first, to compare the consistency of data regarding audiologic practices and procedures in a variety of school settings within a single state, with policy and procedures stipulated in IDEA 97 and the State Plan; and second, to provide a model for gathering data that will

enable local educational agency administrators to make informed policy decisions in special education settings. Field-based data identified specific information and procedures across individual school programs that were inconsistent with state and federal documents. Also, a key factor associated with programs that were highly consistent the State Plan and IDEA 97 was the employment of an educational audiologist who played an active role in direct service provision, in-service training of personnel, and supervision of services provided by others.

◆Efficacy of Using Teachers as Identifiers of Hearing Problems (Kernan, Church, & Martin)

Although most school children are routinely screened for hearing impairment across their academic careers, schools and parents rely on teachers to make referrals when they suspect a hearing problem. To explore the reliability of this referral process, six first-grade educators were asked to identify students in their classrooms who were not likely to pass a hearing screening. They

identified 27 children in all, and then completed SIFTER screeners for each one. One hundred and five pupils from their collective classes were screened at 500-6000Hz at 15dB HL, bilaterally. Results show that teachers' identification rates were 17% sensitive, but 70% specific: that is, they were generally inaccurate in identifying children who would not pass a hearing screening, but among those they did identify, they were generally correct. SIFTER results are also discussed.

◆ “Can You Hear Me?” A Longitudinal Study of Hearing Aid Monitoring in the Classroom (Langan & Blair)

Research articles cite the alarming statistics that, without a daily hearing aid check, 50% of hearing aids worn by school children are malfunctioning on any given day. Analysis of hearing aid monitoring data kept over a seven-year period at one elementary school supports the value of daily monitoring, finding on 5.5% of hearing aids malfunctioning when a child entered his or her classroom in the morning. This malfunction rate was reduced to less than 1% by the time class instruction started when simple troubleshooting procedures were implemented (e.g. readjusting settings or replacing a weak or dead battery). This study suggests that a comprehensive hearing aid monitoring system can effectively eliminate the problems reported the literature. Recommendations for hearing aid monitoring are presented.

◆ The Development and Validation of an “Intelligent” Classroom Sound Field Frequency Modulation (FM) System (Lederman, Johnson, Crandell, & Smaldino)

The adverse acoustical environments often found in classrooms have led to the proliferation of small sound reinforcement systems currently referred to as “sound field amplification systems.” Previous studies detail how speech perception is negatively affected by variable background noise conditions created by poor acoustics, room heating/cooling systems, noisy audiovisual and computer equipment, and other noise generated both inside and outside the classroom. Available manual adjusted sound field systems do not address the fact that background noise levels and a teacher microphone input levels often change throughout the day in a classroom. This article will report on the development and field evaluation of adaptive signal-processing technology that “listens” to the classroom’s changing background noise, automatically adjusting the sound field system’s output in order to maximize signal-to-noise ratio and speech intelligibility. Field test data demonstrated positive effects of this adaptive signal processing technology on speech perception.

◆ AudiSee: An Auditory-Visual-FM System (Gagne)

For several years researchers have investigated the various factors that hinder or facilitate learning in classroom environments, especially with respect to students with hearing loss. Everyone agrees on the fundamental communication process inherent to teaching and on the importance of providing good learning conditions in the classroom. This is why many schools rely on new technology such as assistive listening devices (ALDs) like the well-known FM transmissions systems. While these systems overcome some of the obstacles found in classrooms, many students with hearing loss still struggle. However, the recent arrival of new technology, the audiovisual-FM system, provides added benefit to standard audio-only FM systems in that it transmits both audio and visual speech cues, thereby increasing the ability of students with hearing loss to assimilate information.

◆ Development of a Teacher Needs Survey to Support Students with Auditory Impairments (Dunay & English)

A “needs” survey was developed for classroom teachers who have students with hearing disabilities including auditory processing disorders. The purpose was to provide a vehicle for teachers to communicate needed support to school speech-language pathologists and/or educational audiologists. Five focus groups, including speech-language pathologists, educational audiologists and a deaf education teacher, contributed to the development of the survey. The survey was sent to 50 classroom teachers who have or have had a student with documented auditory impairment in their classroom. A follow-up interview was conducted with participating teachers to assess the utility of the survey. Results indicated an overall rating of very good to excellent by all respondents. The “Teacher Needs Survey” appears to be successful in identifying and communicating the needs of teachers who have students with auditory impairments in their classrooms in a thorough, quick and simple format for the purpose of obtaining needed support.

2001 - Volume 9

◆ A Comparison of the Performance of Classroom Amplifications with Traditional and Bending Wave Speakers (Prendergast)

Classroom amplifications (CA) is used to compensate for the poor acoustics in schools to some degree by amplifying the teacher’s voice and projecting it throughout the classroom via loudspeaker(s), thereby improving the signal noise ratio (S/N). A new loudspeaker technology based on bending wave physics is reported to preserve the speech signal with more fidelity and with less loss of power than traditional cone loudspeakers, thus providing an improved signal as well as an improved S/N. This research compared a ca system coupled with either a traditional or bending wave speaker in a classroom on two measures: (a) an octave band analysis of the frequency distribution

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Topic	Author(s)	Year	Issue	Title
Classroom Acoustics	Anderson	2001	9	Kids in noisy classrooms: What does the research really say?
	Pugh et al	2006	13	Noise levels among first, second, and third grade elementary school classrooms in Hawaii
	Nelson et al	2007-08	14	Background noise levels and reverberation times in old and new elementary school classrooms
	Latham & Blumsack	2007-08	14	Classroom acoustics: A survey of educational audiologists
Cochlear Implants (CI)	McGinnis	2002	10	An electrostatic discharge (ESD) control program for children with cochlear implants
	Schafer & Thibodeau	2003	11	Speech-recognition performance of children using cochlear implants and FM systems
	Anderson et al	2005	12	Benefit of S/N enhancing devices to speech perception of children listening in a typical classroom with hearing aids or a cochlear implant
	Schafer & Kleineck	2009	15	Improvements in speech recognition using cochlear implants and three types of FM systems: A meta-analytic approach
Counseling	Stein et al	2000	8	Adolescents' attitudes toward their peers with hearing impairments
	Crowell et al	2005	12	Use of a self-assessment technique in counseling adolescents with hearing loss: From theory to practice
Early Childhood Intervention (ECI)	Reda et al	2005	12	Impact of the early hearing detection and intervention program on the detection of hearing loss at birth—Michigan, 1998-2002
	Blair & Blair	2007-08	14	Parental perceptions and behavior regarding hearing aid monitoring and maintenance in an early childhood intervention program
Services and Management in Education	Dunay & English	2000	8	Development of a teacher needs survey to support students with auditory impairments
	Takekawa	2007-08	14	Audiology services in Hawaii's public schools: A survey of teachers of the deaf and speech language pathologists
	Richburg & Smiley	2009	15	The "state" of educational audiology revisited
Preparation in Educational Audiology	Beckrow & Nerbonne	2002	10	Preparation in educational audiology: A survey of academic programs in audiology
	Curiel & Nerbonne	2002	10	Preparation in educational audiology: A survey of educational audiologists
	Duncan	2006	13	Application of the auditory-verbal methodology and pedagogy to school age children

and (b) performance by third and fourth graders on a high frequency emphasis, multiple choice speech discrimination test.

◆Effects of Portable Sound Field FM Systems on Speech Perception in Noise (Crandell, Charlton, Kinder, & Kreisman)

The present investigation examined the perceptual benefits of portable, or desktop, sound field Frequency Modulation (FM) systems to more traditional body-worn FM systems. Subjects consisted of 20 adults with normal-hearing sensitivity. Speech perception was assessed by the Hearing in Noise Test (HINT) sentences, while speech spectrum noise served as the noise competition. The HINT sentences were presented to the subjects in three conditions: (1) unaided; (2) portable sound field FM system; (3) body-worn FM with attenuating walkman-style recognition performance in noise compared to unaided listening conditions. However, the body-worn FM systems provided significantly better

speech perception in noise scores than the portable technology. Theoretical, educational, and clinical implications of these data are discussed.

◆Coupling FM Systems to High-Technology Digital Hearing Aids (Nelson)

Hearing aids that use digital signal processing can provide desirable features that could not be realized with conventional ear-level analog hearing aids. While children can benefit from these features, the FM system is still the preferred choice for increasing the signal-to-noise ratio in a classroom. By coupling the two systems together, the benefits of both devices can be obtained. When electroacoustic measurements are made with these combined systems, specific procedures need to be followed to ensure reliable and repeatable results. In this article, hearing aid features that affect electroacoustic measurements will be discussed and procedures will be recommended for obtaining the measurements.

Table 1. Continued Overview of 2000 to 2009 Journal of Educational Audiology Articles Sorted by Topic

Topic	Author(s)	Year	Issue	Title
Educational Audiology: General Topics	English & Vargo	2006	13	How is educational audiology being taught? A review of syllabi from Au.D. programs, Fall 2005
	Blood et al	2007-08	14	Job burnout in educational audiologists: The value of work experience
	Smiley et al	2009	15	Problem-solving ability in elementary school-aged children with hearing impairment
	Hurley & Hurley	2009	15	Auditory remediation for a patient with Landau-Kleffner Syndrome: A case study
	Millett	2009	15	Accommodating students with hearing loss in a teacher of the deaf/hard of hearing education program
Electroacoustic/Real Ear Measurement	Kuk & Ludvigsen	2001	9	Verification of nonlinear hearing aids: Considerations for sound-field thresholds and real-ear measurements
	Wolfe et al	2007-08	14	Clinical evaluation of a verification strategy for personal FM Systems and nonlinear hearing aids
	Naeve-Velguth et al	2009	15	Effect of MicroMLxS Designated Programmable Audio Input (DPAI) and switch settings on FM- and muted-FM transparency for six DPAI hearing instruments
Objective Measures	Friederichs & Friederichs	2005	12	Electrophysiologic and psycho-acoustic findings following one-year application of a personal ear-level FM device in children with attention deficit and suspected central auditory processing disorder
	Plyler et al	2005	12	Auditory neuropathy/dys-synchrony with secondary loss of otoacoustic emissions in a child with autism
	Hurley et al	2007-08	14	Click ABR characteristics in children with temporal processing deficits

◆Kids in Noisy Classrooms: What does the Research Really Say? (Anderson)

The Federal rulemaking agency responsible for implementation of the Americans with Disabilities Act of 1990 has recently sought to define criteria for acoustic conditions to address the needs of persons with disabilities in learning environments. As a result, knowledge of the effects of inadequate acoustic environments on learning has become an increasing interest to groups such as educational administrators, architects, and audiologists. The purpose of this document is to review the body of research applicable to the effects of adverse acoustic environments on children's learning. The direct effects of adverse listening conditions in the classroom will be reviewed. These include the effects of noise on health, the performance of specified tasks, attention, reading ability, and some information on open plan classrooms. This body of research supports the need to address the acoustics of the classroom environment so that all students can learn without detriment from the interfering affects of excessive noise and reverberation.

◆Verification of Nonlinear Hearing Aids: Considerations for Sound-Field Thresholds and Real-Ear Measurements (Kuk & Ludvigsen)

Audiologists have used the behavioral index of the sound-field aided threshold as a tool to verify the performance of linear hearing aids for many years. Its use on nonlinear hearing aids requires a different interpretation and extra precaution. In this paper, we will

explore the meaning of the aided thresholds, review the variables that may affect its reliability, and compare its use to the real-ear insertion gain measurement.

◆Assessing Auditory Processing Problems in the School Setting (English)

Recently, a consensus conference on auditory processing disorders (APDs) recommended a minimal APD test battery (Jerger & Musiek, 2000). These recommendations were made in the interest of defining a "gold standard" for APD assessment; however, they leave educational audiologists at a disadvantage since these professionals do not have ready access to certain clinical procedures. To meet the high volume of referrals for APD assessments in the school setting, it seems that another, second-tier type of test battery is needed; therefore, an alternative test battery is presented here for consideration. As a type of "silver standard" for assessment, it does not allow for a definitive APD diagnosis; however, it does not provide sufficient information to identify a likely auditory processing problem. A two-dimensional model of auditory processing and an assessment matrix are described to provide an organizational framework for this alternative test battery.

◆Auditory Processing Assessment in Children: Towards a Dual Approach (Blumsack)

The behaviors that are typically assessed in children referred for auditory processing concerns often do not relate directly to the behavioral problems that give rise to referral for evaluation. In order to bridge the gap between diagnostic results and classroom behaviors, the present paper advocates the use of instruments that measure both “auditory system mechanisms and processes” (ASHA, 1996) and communicative performance. Such an approach would be beneficial in the design of intervention for affected children.

2002, Volume 10

◆The Effect of Non-Linear Amplifications and Low Compression Threshold on Receptive and Expressive Speech Ability in Children with Severe to Profound Hearing Loss (Gou, Valero, & Marcoux)

The performance of a hearing instrument during a pediatric fitting must be guided under the provision to optimize the development of speech and language. The implementation of a low compression threshold (CT) within non-linear amplification may provide amplification for soft speech, which is otherwise not audible with linear amplification or with non-linear amplification using a high CT. To demonstrate the usefulness of audibility of soft speech, receptive and expressive speech performance was measured with a group of children with severe to profound hearing impairment. Scores were collected first using the child’s prescribed linear hearing instrument and then with a low CT multi-channel non-linear digital signal processing (DSP) hearing instrument. Results indicated an increase in receptive and expressive speech indices using the low CT hearing aid. These findings suggested that children who received this type of amplification during primary intervention benefited from the increased audibility of soft speech in order to enhance speech and language ability.

◆Standardization of the Time Compressed Sentence Test (Keith)

The Time Compressed Sentence Test (TCST) was developed to identify and quantify disorders of auditory processing in children. The test consists of sentences that were time compressed at 0, 40, and 60%. Standardization data was obtained from 13 beta site examiners in 7 states. One-hundred sixty three normally hearing and typically developing children between the ages of 6 and 11 years were administered the test. Statistical analysis of the first 117 children tested found significant differences between the 40% and 60% time compression conditions and for subjects by age. There were also significant differences between right and left ear scores. The implication of these analyses is that it is necessary to interpret findings using tables of norms reported separately for each age and for right and left ears. Descriptive statistics were used to identify “cut-off” scores, and then converted to standard scores and percentiles.

◆Behind-the-Ear FM Systems: Effects on Speech Perception in Noise (Kreisman & Crandell)

The present investigation examined the perceptual benefits of behind the ear (BTE) Frequency Modulation (FM) systems to more traditional body-worn FM systems. Subjects consisted of 20 adults with normal-hearing sensitivity. Speech perception was assessed by the Hearing in Noise Test (HINT) sentences, while speech spectrum noise served as the noise competition. The HINT sentences were presented to the subjects in four conditions: (1) unaided; (2) monaural BTE-FM; (3) binaural BTE-FM; and (4) body-worn FM with attenuating walk-man style headphones. Results indicated that the BTE and body-worn FM systems significantly improved speech-recognition performance in noise compared to unaided listening conditions. However, no significant differences in speech perception were noted between either the BTE or body-worn FM systems. Theoretical, educational, and clinical, implications of these data are discussed.

◆Current Practices in Hearing Conservation Education in Schools (Burns & Tulenko)

Growing national concern prompted Denver area audiologists to include higher frequencies in their testing protocol of middle and high school students. This revealed an alarming number of adolescents with hearing loss in higher frequencies. The need for more hearing conservation education became apparent, and it became important to discover what efforts were already underway and how effective these might be to prevent unnecessary duplication and maximize the use of the most effective programs. The purpose of the study was to find out how widespread hearing conservation education is in schools and to assess the types of school hearing conservation education programs that have been implemented across the United States. An electronic survey was designed and e-mailed to educational audiologists and to others who might provide audiology services or hearing conservation education services in schools in the United States. More than 90 percent of educational audiologists and 80 percent of non-educational audiologists indicated that they felt hearing conservation education is important. However, only 35 percent of educational audiologists said they provide it. Twenty-one percent of non-educational audiologists provide hearing conservation education, but less than 1 percent interact directly with children and adolescents while 45 percent consider themselves a professional resource in this regard. The results of the survey leave little doubt that a large number of our students in the public schools do not have access to hearing conservation education. The findings clearly suggest a need for more direct instruction in hearing loss prevention in public schools.

◆Preparation in Educational Audiology: A Survey of Academic Programs in Audiology (Beckrow & Nerbonne)

A survey of academic programs accredited by the American Speech-Language Hearing Association (ASHA) in audiology was conducted to determine the preparation of students in knowledge and skills targeting the minimum competencies for educational audiologists as established by the Educational Audiology Association (EAA). Responses from 48 programs generally indicate that students receive considerable academic and clinical preparation for those competencies associated with assessment and other mainstream areas of clinical audiology but substantially less preparation in most of the competencies related to audiology within the educational setting. Thus, current programs in audiology do not appear to be preparing graduates any better for employment in the schools than has been reported in the past.

◆Preparation in Educational Audiology: A Survey of Educational Audiologists (Curiel & Nerbonne)

Completed surveys were obtained from 425 educational audiologists concerning the degree of competence each felt he/she possessed in key areas of educational audiology upon graduation. Results indicated generally strong competency ratings for those areas closely aligned with mainstream clinical audiology, but the competency ratings were much lower for aspects directly associated with practicing audiology in the school setting. These results strongly suggest the need for substantial changes in how future audiologists are prepared academically and clinically in educational audiology.

◆An Electrostatic Discharge (ESD) Control Program for Children with Cochlear Implants (McGinnis)

The increasing presence in educational programs of infants and young children with cochlear implants mandates that professionals become knowledgeable about electrostatic discharge (ESD), so that they can provide a safe educational environment for children. An ESD-controlled program presented that is practical and inexpensive for most educational situations. An ESD inservice module for parents and professionals is also presented.

2003, Volume 11

◆A Comparison of Lecture and Problem-Based Instructional Formats for FM Inservices (Naeve-Velguth, Hariprasad, & Lehman)

This study compared the pedagogical approaches of traditional lecture and problem-based learning (PBL) for professional inservice instruction on classroom FM systems. Participants attended either a lecture or PBL instructional session, and each completed a pretest, immediate post-test, and one-week post-test examination of his or

her knowledge of three FM systems (Phonic Ear Personal Easy Listener, Phonic Ear FreeEar, Phonak MicroLink). The findings indicated that the PBL group's post-instruction scores were significantly higher than those of the lecture group. These data and other findings are discussed in terms of the potential effectiveness of PBL as an instructional model for FM inservices.

◆Speech-Recognition Performance of Children Using Cochlear Implants and FM Systems (Schafer & Thibodeau)

Sentence recognition was evaluated for ten children with cochlear implants (CIs) in quiet, noise, and in four FM system arrangements: desktop soundfield, body-worn, miniature direct-connect, and miniature cord-connect. The CI speech processors remained at user settings during testing, and the children adjusted the volume controls on the FM receivers to comfortable levels while listening to running speech. No significant differences were found in thresholds for speech-weighted noise obtained across the four FM system arrangements, which suggested that the children were able to adjust the volume settings on the FM system receivers to relatively equal perceptual levels. When listening with their implant alone, the children's sentence recognition was significantly affected by the presence of the background noise. The use of all four FM system arrangements resulted in significantly improved performance in noise relative to the implant-alone condition. There were no significant differences in average speech recognition scores across the FM systems.

◆ Educational Testing for Auditory Processing: A Retrospective Study (Garfinkel)

Although school-based audiologists frequently assess auditory processing problems in children, there is a lack of standardized educational guidelines for auditory processing referrals. The American Speech-Language-Hearing Association (ASHA; 1996) statement on auditory processing provides definitions of auditory processing and the characteristics presented by children with auditory processing disorders. The procedures used to refer and test children suspected of auditory processing disorders within an educational system vary by state and by personnel providing these services within the school systems. There is little research on how educational teams decide which children should receive educational assessments for auditory processing problems. The purpose of this study was to determine if school districts followed recommended referral procedures when referring students for auditory processing evaluations.

Results revealed that school districts were following most of the recommended procedures for making auditory processing referrals in the two years studied. A retrospective analysis of student records indicated that school districts were meeting

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Frequency Modulated (FM)/ Infrared Systems	Lederman et al	2000	8	Development and validation of an “intelligent” classroom sound field frequency modulated (FM) system
	Gagne	2000	8	AudiSee: An auditory-visual-FM System
	Prendergast	2001	9	A comparison of the performance of classroom amplification with traditional and bending wave speakers
	Crandell et al	2001	9	Effects of portable sound field FM systems on speech perception in noise
	Nelson	2001	9	Coupling FM systems to high-technology digital hearing aids
	Kreisman & Crandell	2002	10	Behind-the-ear FM systems: Effects on speech perception in noise
	Naeve-Velguth et al	2003	11	A comparison of lecture and problem-based instructional formats for FM inservices
	Schafer & Thibodeau	2003	11	Speech-recognition performance of children using cochlear implants and FM systems
	Taub et al	2003	11	Reducing acoustic barriers in classrooms: A report comparing two kindergarten classrooms in an inner-city school
	Anderson et al	2005	12	Benefit of S/N enhancing devices to speech perception of children listening in a typical classroom with hearing aids or a cochlear implant
	Friederichs & Friederichs	2005	12	Electrophysiologic and psycho-acoustic findings following one-year application of a personal ear-level FM device in children with attention deficit and suspected central auditory processing disorder
	Flynn et al	2005	12	The FM advantage in the real classroom
	Edwards & Feun	2005	12	A formative evaluation of sound-field amplification system across several grade levels in four schools
	Updike	2006	13	The use of FM systems for children with attention deficit disorder
	Wolfe et al	2007-08	14	Clinical evaluation of a verification strategy for personal FM systems and nonlinear hearing aids
Schafer & Kleineck	2009	15	Improvements in speech recognition using cochlear implants and three types of FM systems: A meta-analytic approach	
Naeve-Velguth et al	2009	15	Effect of MicroMLxS Designated Programmable Audio Input (DPAI) and switch settings on FM- and muted-FM transparency for six DPAI hearing instruments	

many of the 10 goals for student referral set forth by the Lincoln Intermediate Unity (LIU) #12 Task Force on Auditory Processing. Most of the referred children met the basic requirements of having intelligible speech, normal hearing, being in academic struggle, and completion of the Instructional Support Team process, completion of a psychoeducational evaluation and completion of the LIU #12 checklist for auditory processing referrals. Areas that still need improvement include completion of a full speech and language evaluation prior to the referral to the audiologist and the Instructional Support Team’s use of prescreening forms.

◆The Word Intelligibility by Picture Identification Test: A Two-Part Study of Familiarity and Use (Stewart)

The Word Intelligibility by Picture Identification (WIPI) Test was published as a means to “assess the speech discrimination ability of hearing impaired children” (Ross & Lerman, 1970). The WIPI remains a popular test among pediatric audiologists, even though many of the pictures now appear out-of-date and

several illustrations seem insensitive to our current social mores. None of the drawings reflect the racial diversity of the American population. In this two part pilot study, the WIPI was presented to a group of 16 normally hearing five- to eight-year old children, two boys and two girls at each level, to determine if they had difficulty identifying any test pictures or vocabulary. The data showed that the six- to eight-year-old children had little difficulty recognizing the test pictures or vocabulary. Children in the five-year-old group demonstrated a considerable number of errors. Eight of the 150 test items were missed consistently across all age groups. Additionally, an on-line survey was disseminated to approximately 800 audiologists to examine how they currently use the WIPI test. Results confirmed that the majority of pediatric audiologists who responded to the survey use this test. These audiologists indicated that they chose the WIPI more often than any other closed-set word recognition test. However, a substantial number of audiologists reported that they varied their test presentation from the protocol outlined by Ross and Lerman.

◆A Checklist/Protocol for Audiologists: Is This Hearing Aid Appropriate for This Individual? (Palmer)

After reading news of exciting advances in hearing aid technology many patients, parents, and educators are asking the question “Is this hearing aid appropriate for me/my child?” The audiologist is challenged with answering this question from four constituencies: 1) patients or parents of children seeking an appropriate hearing aid solution; 2) a physician posing the question about one of his/her patients; 3) educational audiologists guided by legislation or guidelines that recommend testing of each child’s hearing aid once per year resulting in a report documenting the adequacy of the fitting; and 4) health professionals such as speech-language-pathologists, occupational therapists, and physical therapists whose treatment may depend on or be modified by the individual’s ability to hear. Four primary hearing aid fitting goals are identified and a test protocol is suggested to evaluate whether these goals have been met by an individual’s current hearing aids. A case is presented to illustrate the protocol and provide discussion related to the possible results of the assessment and subsequent actions that might be recommended.

◆Reducing Acoustic Barriers in Classrooms: A Report Comparing Two Kindergarten Classrooms in an Inner-City School (Taub, Kanis, & Kramer)

A project was undertaken to demonstrate the effects of sound-field amplification on learning in a low socioeconomic urban classroom environment. The results of testing for identifying children who are at risk for academic difficulty as measured by the Preschool S.I.F.T.E.R. and phonological awareness as measured by the TOPA (Kindergarten Version) for two kindergarten classes were compared. Implications of these findings are presented.

2005, Volume 12

◆Child Distress and the Use of a Teddy Bear Model during Preschool Audiologic Screenings (Naeve-Velguth, Griffin, & Lehman)

Clinical experience suggests that young children may become distressed when undergoing otoscopy and tympanometry, two procedures routinely performed as a part of pediatric audiologic screenings. If a child’s distress is moderate or extreme, it may result in behaviors that are disruptive to testing, cause parent upset, or interfere with the parent education component of the screening session. Research suggests that child distress may be reduced when healthcare practitioners prepare children for upcoming procedures by first demonstrating these procedures on a medical doll or stuffed animal. The present study compared child behavioral distress during routine audiologic screenings for two groups of children: Those for whom otoscopy and tympanometry

were modeled on a teddy bear prior to testing and those for whom these procedures were performed without a teddy bear model. The results indicated that a greater number of children who saw a teddy bear model were relatively less distressed during otoscopy and tympanometry, as compared to a group of children for whom a teddy bear was not used. The use of a teddy bear model was specifically associated with fewer children being physically restrained and more children smiling, as compared to children who were tested using standard clinical procedures. The inclusion of a teddy bear added no more than 30 seconds of modeling time to the screening session, did not lengthen the actual period of otoscopic and tympanometric assessment, and did not negatively affect test outcomes. The application of these findings to hearing screening and other pediatric audiological procedures is discussed.

◆Benefit of S/N Enhancing Devices to Speech Perception of Children Listening in a Typical Classroom with Hearing Aids or a Cochlear Implant (Anderson, Goldstein, Colodzin, & Inglehart)

Speech perception can be improved for children with hearing loss using signal-to-noise ratio (S/N) enhancing devices. Three experiments were performed with 28 participants, age 8 to 14 years using hearing aids or a cochlear implant. Participants repeated HINT sentence lists in classrooms with a typical level of background noise and reverberation times of either 1.1 seconds or 0.6 seconds. In addition to personal amplification, the types of devices used were a classroom sound field system, a desktop personal sound field FM system, and a personal FM system linked to hearing aids or cochlear implant. The speech perception results of the three experiments support the use of a desktop or personal FM system by children with hearing loss who are auditory learners whether a poor or acceptable level of reverberation is present. Based on the results of this investigation, providing classroom sound field amplification as a means to benefit speech perception of students with mild to profound bilateral hearing loss who are successful learners in the mainstream appears to be an unjustified practice for approximately 80% of students with hearing loss. Approximately 20% of participants did benefit by least 5% in word recognition score improvement from classroom sound field amplification over use of their personal devices alone. Performance scores of these participants indicated an additional 5% or greater benefit to word recognition when using desktop or personal FM as compared to their scores using classroom sound field. Results indicated that 64% of participants believed that the personal FM device provided easiest listening with either the personal FM or desktop FM being preferred for use by 26 of the 28 participants.

Table 1. Continued Overview of 2000 to 2009 Journal of Educational Audiology Articles Sorted by Topic

Topic	Author(s)	Year	Issue	Title
Hearing Aids (HA)	Langan & Blair	2000	8	“Can you hear me?” A longitudinal study of hearing aid monitoring in the classroom
	Nelson	2001	9	Coupling FM systems to high-technology digital hearing aids
	Kuk & Ludvigsen	2001	9	Verification of nonlinear hearing aids: Considerations for sound-field thresholds and real-ear measurements
	Gou et al	2002	10	The effect of non-linear amplifications and low compression threshold on receptive and expressive speech ability in children with severe to profound hearing loss
	Palmer	2003	11	A checklist/protocol for audiologists: Is this hearing aid appropriate for this individual?
	Anderson et al	2005	12	Benefit of S/N enhancing devices to speech perception of children listening in a typical classroom with hearing aids or a cochlear implant
	Wolfe et al	2007-08	14	Clinical evaluation of a verification strategy for personal FM systems and nonlinear hearing aids
	Blair & Blair	2007-08	14	Parental perceptions and behavior regarding hearing aid monitoring and maintenance in an early childhood intervention program
	Aurimmo et al	2009	15	Efficacy of an adaptive directional microphone and a noise reduction system for school-aged children
Hearing Conservation	Burns & Tulenko	2002	10	Current practices in hearing conservation education in schools
	Naeve-Velguth et al	2006	13	Comparison of lecture and computer-based methods for hearing conservation instruction: Implications for secondary education
Hearing Screenings	Kernan et al	2000	8	Efficacy of using teachers as identifiers of hearing problems
	Naeve-Velguth et al	2005	12	Child distress and the use of a teddy bear model during preschool audiologic screenings
	Richburg & Imhoff	2007-08	14	Survey of hearing screeners: Training and protocols used in two distinct school systems

◆Electrophysiologic and Psycho-Acoustic Findings Following One-Year Application of a Personal Ear-Level FM Device in Children with Attention Deficit and Suspected Central Auditory Processing Disorder (Friederichs & Friederichs)

This study examined whether electrophysiological and psycho-acoustic auditory measures would reflect changes following use for one year of a personal ear-level frequency-modulated (FM) device in a group of children with symptoms of central auditory processing disorder (CAPD). Subjects consisted of 10 children aged 7 to 14 years with normal hearing thresholds, suspected CAPD, and additional attention and/or learning difficulties. The children were provided with a personal ear-level FM system which was required to be used mainly during school time for one year. An age-matched control group was also followed over the time period of one year. Results indicated that the children who used the ear-level personal FM device exhibited significantly improved performance on specific tests of auditory function compared to the control group. Furthermore, electrophysiological late event-related potentials revealed significant changes in the experimental group, suggesting an accelerated neuromaturational process when using a FM-device compared to an age-matched control group. Parents and teachers also reported a significant improvement in speech understanding and in overall school performance as well as

accompanying conduct behavior in the children who used the FM device. Results of this study suggest that the late auditory event-related potentials are sensitive to changes in clinical development of children using an ear-level FM device. Results also indicate that use of an ear-level FM device results in improved behavioral and electrophysiologic auditory performance.

◆The FM Advantage in the Real Classroom (Flynn, Flynn, & Gregory)

The present study examined the benefits of students using personal FM systems in their own classroom and in the home. Eleven students aged between 5 and 15 years participated in the study. All participants had a sensorineural hearing loss ranging in degree from moderate to profound. During the study, the students used the FM system combined with their hearing aid at school and at home for three months. Performance was documented using measures of oral language comprehension in the student's daily classroom combined with self-report measures obtained from the parents, teachers and students. Results indicated a significant benefit for the use of the FM system combined with the hearing aid over the hearing aid alone in the real classroom. Parents and students reported a significant benefit for use of the FM system at home. Teachers, parents, and students identified an improvement in

specific situations of need. This study supports the recommendation of combining a personal FM system with the student's hearing aid to improve speech understanding in school and in the home.

◆Relationship of Auditory Processing Categories as Determined by the Staggered Spondaic Word Test (SSW) to Speech-Language and Other Auditory Processing Test Results (Gustafson & Keith)

In his Buffalo Model, Katz (1992) used primarily scores on the Staggered Spondaic Word test (SSW) to categorize children with auditory processing disorders. From this categorization, speech-language difficulties were predicted and management techniques were proposed within the Buffalo Model. This retrospective study of 159 files examined the relationship among test results on the SSW and other tests of speech-language and auditory processing. Results showed few significant correlations between speech-language and auditory processing measures and separate components of the SSW test. Most of the significant correlations had such low magnitude as to not be clinically significant. Descriptive analysis of reading skills and pitch pattern performance suggested results contrary to the Buffalo Model. The results indicate a lack of construct validity for the Buffalo Model, suggesting that a "cookbook" approach to management using this model should be approached with caution in managing children with auditory processing disorders.

◆A Formative Evaluation of Sound-Field Amplification System across Several Grade Levels in Four Schools (Edwards & Feun)

A formative evaluation was conducted during the 2002 - 2003 school year to determine the degree to which sound-field amplification systems were being implemented in the schools involved in the study and to make improvements/adjustments as necessary. The issues or questions addressed in our evaluation were: 1) How effective was the training provided to the teachers? 2) How often are teachers using the equipment? 3) What effects does using this equipment have on the teachers? 4) What effects does using this equipment have on the students? Two on-site visits were made by an evaluation team to each of the four schools involved in the study during the course of the 2002-03 school year. In addition, a teacher survey was administered at the end of the school year. Results indicated that 95% of the teachers used the sound-field system to some degree. Teachers reported less voice strain, greater clarity of their voices, and improved student attention and participation with use of the sound-field systems. Teachers also identified several areas of needed improvement in the equipment itself and in service-related areas. This study will present these results, along with several recommendations regarding additional equipment needs, training, and need for additional consultation.

◆Use of the California Consonant Test with Children (Prendergast)

The potential advantages of using the California Consonant Test (CCT) (Owens & Schubert, 1977) with children are discussed, followed by reports of two exploratory investigations. In the first investigation, the CCT was administered in classrooms to second, third and fourth graders with normal hearing. The children scored within 13% of an adult control group, suggesting that the CCT was not too difficult for them. In the second investigation, the CCT was administered to 11 children with hearing loss in classrooms with various amplification combinations. Their scores were lower and more variable than the scores of the children with normal hearing, but all scored above chance, suggesting that the CCT was within their capabilities as well. Additional areas of research and uses of the CCT with children are discussed.

◆Auditory Neuropathy/Dys-synchrony with Secondary Loss of Otoacoustic Emissions in a Child with Autism (Plyler, Plyler, & Little)

Otoacoustic emissions are commonly present in cases of auditory neuropathy/dys-synchrony; however, otoacoustic emissions are absent or disappear in approximately one-third of patients with the disorder. Failure to identify AN/AD patients with absent otoacoustic emissions may result in improper diagnosis and management. The purpose of this article is to present findings from a case of auditory neuropathy/dys-synchrony with secondary loss of otoacoustic emissions to increase clinician awareness regarding the relationship between otoacoustic emissions and the disorder.

◆Impact of the Early Hearing Detection and Intervention Program on the Detection of Hearing Loss at Birth—Michigan, 1998-2002 (Reda, Grigorescu, & Jarrett)

The objective of this study was to evaluate the impact of the Early Hearing Detection and Intervention (EHDI) program on the detection of hearing loss (HL) at birth in Michigan. Using EHDI surveillance data for 1998-2002, we calculated screening, referral, and evaluation rates, as well as the rate of enrollment into early intervention (EI) services. We determined that during the 5-year study period, screening rates increased from 22.8% to 92.1%, referral rates declined from 4.7% to 2.8%, and the mean age (and range) at diagnosis of HL decreased (and narrowed) from 6.49 months (range: 0.03-44.27) to 2.65 months (range: 0.07-10.67). The proportion of referred infants with reported re-screening or diagnostic evaluation results remains below 50.0%. Among those referred to EI services with known follow-up, enrollment in services was reported by 74.6%; of these, 48.6% enrolled by age 6 months. Our results suggest that EHDI has improved the detection of HL in the newborn period in Michigan; however, sub-

optimal reporting threatens the validity of our findings. Continued development of EHDI programs, collaboration with EI providers, and mandated reporting may improve the quality of EHDI data and assure that newborns screened for HL receive appropriate follow-up services.

♦**Use of a Self-Assessment Technique in Counseling Adolescents with Hearing Loss: From Theory to Practice (Crowell, English, McCarthy, & Elkayam)**

Adolescents with impaired hearing often feel isolated, receiving little support from peers or audiologists. This tutorial describes how educational and pediatric audiologists can use a recently developed self-assessment tool as a counseling strategy when working with the adolescent population. The reader is provided with literature reviews in three topics: Counseling and its application to audiologic practices, the developmental issues of adolescents and the impact of hearing loss during this time in life, and the use of self-assessments as a counseling tool. The final section integrates these topics to demonstrate how a self-assessment designed for teens with hearing loss can provide a counseling framework for educational and pediatric audiologists interested in providing counseling support. Hypothetical scenarios are included in the Appendix to illustrate the use of the self-assessment instrument.

2006, Volume 13

♦**The Use of FM Systems for Children with Attention Deficit Disorder (Updike)**

This research study was undertaken to evaluate the effects of using FM systems with children having attention deficit disorder. Word recognition ability, attention and listening skills, and academic scores were compared for pre- versus post-FM fitting. Implications of these findings and suggestions for further research are presented.

♦**How is Educational Audiology Being Taught? A Review of Syllabi from Au.D. Programs, Fall 2005 (English & Vargo)**

Little is known about the nature and extent of educational audiology courses taught in graduate training programs. The two purposes of the present investigation were (1) to determine how many of the 60 accredited Audiology Doctorate (AuD.) programs in the United States include a course in educational audiology in their curriculum, and (2) to summarize the learning objectives from those courses. We learned that slightly more than half of the programs either require a class in educational audiology (N = 25, 42%) or incorporate educational audiology content in other courses (N = 7, 12%). A qualitative analysis of 167 learning objectives from course syllabi indicated a strong consensus across programs

regarding expected student outcomes. Educational audiology is now a recognized specialty among many training programs and is being taught with consistency across programs.

♦**Comparison of Lecture and Computer-Based Methods for Hearing Conservation Instruction: Implications for Secondary Education (Naeve-Velguth, Locke, Stewart, & Lehman)**

Research indicates that children and young adults are at risk for noise-induced hearing loss and can benefit from hearing conservation instruction. The purpose of this study was to examine participant learning about hearing conservation topics, including background information (e.g., anatomy and physiology) and hearing conservation specific content (e.g., hearing loss prevention), as presented through a lecture vs. a computer-based format and assessed by a 20-point post-instruction exam. The results indicated greater learning of background content for lecture instruction, but no difference between instructional modes for hearing conservation-specific material. These data are discussed in terms of implications for secondary education.

♦**Acceptance of Background Noise in Children with Normal Hearing (Freyaldenhoven & Smiley)**

The present study measured acceptance of noise in 32 children (age 8 and 12 years) with normal hearing sensitivity. Results demonstrated that acceptable noise levels (ANLs) are not dependent on type of noise distraction, gender, or age of the child, at least for children 8 and 12 years of age. Results further demonstrated that ANLs can be obtained reliably in children in 2-4 minutes and are normally distributed. Clinical implications and applications are discussed.

♦**Noise Levels Among First, Second, and Third Grade Elementary School Classrooms in Hawaii (Pugh, Miura, & Asahara)**

This study examined background and octave band noise levels collected from a combination of 79 unoccupied urban public and private school classrooms in Hawai'i (island of Oahu). Noise measurements were obtained from first, second, and third grade classrooms and room characteristics were determined for each classroom tested. Measurements were obtained in decibels with the sound level meter weighting switch in "A" position (dBA) and octave band noise spectra were collected to determine Noise Criteria (NC) ratings. Results indicated mean noise levels of all classrooms were above the 30 dBA criterion recommended by the American Speech and Hearing Association (ASHA, 1995), the 20 dB NC rating recommended by the American Speech and Hearing Association (ASHA, 1995), and the 35 dBA criterion recommended by the American National Standards Institute (ANSI, 2002) for educational settings. These findings are discussed.

◆**Application of the Auditory-Verbal Methodology and Pedagogy to School Age Children (Duncan)**

As children progress through school, the complexity of the linguistic-auditory-cognitive signal increases, requiring the student to process more sophisticated information. Consequently, students with a hearing loss who have developed spoken language through audition must have advanced strategies in place to deal with this mounting challenge. For these students, the auditory-verbal methodology can be a suitable intervention approach. It is important that audiologists understand this methodology whether or not they provide aural (re)habilitation. This paper examines the current principles, teaching behaviors and lesson-planning framework that comprise the application of the auditory-verbal methodology and pedagogy to school age children.

2007/2008, Volume 14

◆**Job Burnout in Educational Audiologists: The Value of Work Experience (Blood, Cohen & Blood)**

Job burnout levels of educational audiologists were determined using a standardized inventory. Eighty-one percent of the 361 participants rated their overall job burnout in the “average or low” range. Participants’ scores were in the low burnout range for both the Depersonalization and Personal Accomplishment subscales. A significantly greater number of participants with less than 10 years of experience had scores in the high burnout range for the Emotional Exhaustion subscale when compared with participants with more work experience. The importance of sharing these results with training programs and administrators is discussed in terms of recruitment and retention.

◆**Background Noise Levels and Reverberation Times in Old and New Elementary School Classrooms (Nelson, Smaldino, Erler, & Garstecki)**

The adequacy of the acoustic environment of classrooms is an important factor in a child’s ability to listen and learn. Undesirable noise and reverberation can affect the achievement and educational performance of children, both those with normal and impaired hearing. The purpose of this study was to evaluate the acoustical conditions of old and new elementary school classrooms. Results were compared to the American National Standards Institute standard for acoustical characteristics of classrooms (ANSI S12.60-2002). Results indicated that neither new nor old classrooms for children with normal hearing were in compliance with the ANSI classroom background noise standard but all classrooms met the minimum reverberation criteria.

◆**Click ABR Characteristics in Children with Temporal Processing Deficits (Hurley, Hood, Cullen, & Cranford)**

Temporal processing deficits are one characteristic of a (central) auditory processing disorder [(C)APD]. Combining behavioral and electrophysiologic methods in the (C)APD battery is valuable. This investigation focuses on auditory brainstem response (ABR) measures in a group of children with specific temporal processing deficits and an age-matched control group. No significant differences in ABR waveform latency were found, but there were significant amplitude differences between control and experimental groups. The ABR in an interaural time delay (ITD) paradigm did not demonstrate differences between groups. While group differences in this study were limited, they nonetheless support the value of electrophysiological measures in (C)APD assessment.

◆**Survey of Hearing Screeners: Training and Protocols Used in Two Distinct School Systems (Richburg & Imhoff)**

This study compared the training and protocols used by two groups of elementary school hearing screeners: one group of school nurses and one group of contractually hired personnel. The participants were asked to complete a survey concerning their training, screening protocols, and opinions on minimal hearing loss (MHL). Results revealed that the school nurses listed more sources of training and reported a greater variation in hearing screening protocols, while the contractual screeners listed fewer training sources and used more uniform screening protocol. Possible reasons for these differences are given, and comparisons on other survey items, including opinions on MHL, are discussed.

◆**Clinical Evaluation of a Verification Strategy for Personal FM Systems and Nonlinear Hearing Aids (Wolfe, Miller, Swim, & Schafer)**

The primary aim of this study was to characterize the problems that may arise when following the ASHA 2002 guideline for fitting of FM systems to conduct electroacoustic verification of the FM advantage provided by nonlinear hearing aids. Electroacoustic output of FM systems coupled to nonlinear digital hearing aids was determined using the ASHA recommended procedure. When the ASHA recommended +10 dB FM advantage was not obtained, gain of the FM receiver was adjusted and additional electroacoustic measurements were conducted to illustrate changes in output, distortion, and equivalent input noise that may occur when increases in FM receiver gain are provided.

♦Classroom Acoustics: A Survey of Educational Audiologists (Latham & Blumsack)

An electronic survey of 34 educational audiologists was conducted to obtain their perceptions regarding classroom acoustical conditions in their schools. Respondents indicated that 1) walls in their schools were constructed mainly of drywall and/or cinder blocks, 2) there was an approximately even distribution of carpet, vinyl, and area rug flooring, and 3) typically there are multiple windows without closed drapes. Commonly reported noise sources were unattached desks and chairs, frequent use of overhead projectors, and one or more classroom computers typically running during the school day. A large majority of the respondents reported that the HVAC systems were, in their opinion, loud enough to make listening to the teacher difficult, but noise from external sources (such as road traffic and aircraft noise) was reported to be less of a concern.

♦Parental Perceptions and Behavior Regarding Hearing Aid Monitoring and Maintenance in an Early Childhood Intervention Program (Blair & Blair)

The value of early hearing detection and intervention is significantly undermined when hearing aids fail to perform consistently. A parent questionnaire was developed to investigate parent training and perceived competency in hearing aid care, ownership/use of test kit items, frequency of hearing aid checks, and reasons for not performing hearing aid checks. Thirty-one parent questionnaires were obtained from families of children with hearing aids who were enrolled in the Utah Parent Infant Program. Findings indicate that parents are generally well-equipped with the necessary tools to monitor hearing aid function, but they are not making regular use of these items. Many parents check hearing aids infrequently and/or improperly. Implications and potential solutions are discussed.

♦Different Professionals' Interpretation of a Decoding Deficit in Reading Skills (McNamara, Bailey, & Harbers)

An educational profile of a fictitious child with a decoding deficit in reading skills was distributed by mail to audiology, speech-language pathology, and reading specialty professionals throughout the United States. Each participant was asked to review the profile and complete a questionnaire. The survey asked open-ended questions concerning the professional's interpretation of what may be the basis of the child's learning difficulties and the assessment tools needed for an evaluation. This study reviewed each professional's analysis of the possible origin of the learning difficulty and determined if a common response theme emerged from the different professional groups.

♦Audiology Services in Hawaii's Public Schools: A Survey of Teachers of the Deaf and Speech Language Pathologists (Takekawa)

The Hawaii public school system employs one audiologist for approximately 178,000 students ages 3 through 21. The American-Speech-Language-Hearing Association and the Educational Audiology Association contend that there should be one audiologist for every 10,000 students to adequately deliver services. The purpose of this study was to determine what audiology services are currently being provided in Hawaii's public schools and who, besides audiologists, are performing them. Speech language pathologists (SLPs) and teachers of the deaf (TODs) were identified as the most likely professionals to be providing audiology services to students in the absence of audiologists, and were therefore asked to respond to an online survey of audiology services in the schools. A total of 128 SLPs and TODs completed the survey. Survey results indicated that SLPs and TODs are performing duties that fall under the scope of practice of audiologists. It was determined that employing more audiologists in the Hawaii public school system would improve access to appropriate audiology services to students. Further research in this area could help determine if Hawaii is unique, or if, out of necessity, SLPs and TODs have taken over audiology duties in school systems with less than the recommended 1:10,000 audiologist-to-student ratios.

2009, Volume 15

♦Improvements in Speech Recognition Using Cochlear Implants and Three Types of FM Systems: A Meta-Analytic Approach (Schafer & Kleineck)

A meta-analytic approach was used to compare improvements in speech recognition of children and adults with cochlear implants (CIs) when using traditional soundfield, desktop soundfield, and direct-audio input (DAI) frequency-modulated systems. There was no significant benefit from traditional soundfield systems when compared to the CIs alone. No significant difference was detected between traditional and desktop soundfield receivers. The DAI receivers provided significantly greater gains in speech recognition when compared to the desktop receivers. According to the results of this analysis, audiologists working with CIs should recommend receivers that directly connect to the CI speech processor (i.e., DAI).

◆**Efficacy of an Adaptive Directional Microphone and a Noise Reduction System for School-Aged Children (Aurimmo, Kuk, Lau, Dornan, Sweeton, Marshall, Pikora, Quick, Thiele, & Stenger)**

A non-randomized, experimental study utilizing double-blinding was implemented to investigate differences in word recognition performance of school-aged children utilizing adaptive directional microphone and noise reduction (NR) features. Children from two educational facilities participated in this study. Signal-to-noise ratio (SNR) benefit of the adaptive directional system was estimated to be 7.6 dB. No SNR benefit was measured for the NR feature; however, no decrease in performance was observed either. Subjective difficulty for desired sounds originating from various azimuths was not significantly greater in either the adaptive directional or NR modes. Results indicate that for the purposes of improving SNR, adaptive directional microphone systems, but not NR systems, are potentially efficacious hearing aid fitting options for school-aged children.

◆**Problem-Solving Ability in Elementary School-Aged Children with Hearing Impairment (Smiley, Thelin, Lance, & Muenchen)**

The present study was conducted to evaluate the problem-solving ability of children with hearing impairment. The performance of a group of children with hearing impairment (HI Group) was compared to that of a group of children with normal hearing (NH Group). The participants were asked to solve two types of mathematical problems: those requiring computation alone and word problems requiring the use of both language and mathematical computation. The results of this study revealed that there were no significant differences between the HI Group and NH Group in the ability to solve mathematical equations involving the use of language and mathematical computation problems. Additionally, it was found that problem-solving ability was related to language ability, but not to hearing ability in the children with hearing impairment.

◆**The Word Intelligibility by Picture Identification (WIPI) Test Revisited (Cienkowski, Ross, & Lerman)**

The Word Intelligibility by Picture Identification (WIPI) test is a widely used test to assess speech recognition for pediatric clients. Since the test was developed over 30 years ago, a number of the pictures are outdated and several test items have been reported to be unrecognizable by children today. The purpose of this study was to evaluate a revised version of the WIPI. The test included modernized items and eliminated pictorial confusions. The result was four revised lists found to be equivalent for a group of children with normal hearing.

◆**Exploring the Usefulness of Fisher's Auditory Problems Checklist as a Screening Tool in Relationship to the Buffalo Model Diagnostic Central Auditory Processing Test Battery (Strange, Zalewski, & Waibel-Duncan)**

In 1996, ASHA addressed the need for appropriate tools to screen for (C)APD; yet, no universally accepted screening tool has been identified. The purpose of the current study was to determine if Fisher's Auditory Problems Checklist (Fisher, 1976) is a useful screening tool. A Chi Square goodness-of-fit test found that children who scored at or below cutoff on Fisher's Checklist were significantly more likely to receive a diagnosis of (C)APD ($X^2 = 22.5, p < 0.05$) based on the Buffalo Model Diagnostic Test Battery. The current study offers preliminary support for the clinical usefulness of Fisher's Auditory Problems Checklist (Fisher, 1976) as a screening tool.

◆**Effect of MicroMLxS Designated Programmable Audio Input (DPAI) and Switch Settings on FM- and Muted-FM Transparency for Six DPAI Hearing Instruments (Naeve-Velguth, Miller, & Kujawa)**

The first purpose of this study was to evaluate the effect of FM receiver setting (DPAI-yes/2-dot, DPAI-yes/1-dot, DPAI-no/2-dot, DPAI-no/1-dot) on FM transparency, measured as FM offset (in dB), for each of six Designated Programmable Audio Input (DPAI) hearing instruments coupled to one Phonak MicroMLxS FM receiver and one Campus-Sx FM transmitter. The second purpose was to assess the effect of muting the FM microphone (i.e., muted-FM transparency, measured as muted-FM offset, in dB) for each hearing aid and DPAI/dot setting. The results indicated that for five of the six aids, mean three-frequency average (750, 1000, 2000 Hz) FM offset was within FM transparency tolerances (American Academy of Audiology, 2008b) for the DPAI-yes/2-dot, DPAI-yes/1-dot, and DPAI-no/1-dot conditions, but exceeded tolerances for the DPAI-no/2-dot condition. For the sixth hearing instrument, mean three-frequency average FM offset was within tolerances for each DPAI/dot condition. The data of the present study also indicated that mean three-frequency average muted-FM offset was within transparency tolerances for all aids in all DPAI/dot conditions. Implications of these data for FM system management in the schools are discussed.

◆**The "State" of Educational Audiology Revisited (Richburg & Smiley)**

The Educational Audiology Association conducted a survey of state education agencies in 1990 (Johnson, 1991) to determine the status of audiological services being provided to children with hearing impairments in the schools at that time. A follow-up survey was conducted in 2007 to determine (1) the "state" of educational

audiology throughout the United States and (2) if changes have occurred in the delivery of school-based services over the past 17 years. The results revealed that, although some changes have occurred, there have been no substantial improvements in the numbers of audiologists providing services in the schools. In addition, federally mandated guidelines have not provided for universal hearing screenings in every school system, and states have not substantially changed their definition of hearing loss for the purposes of considering a child for special education services.

♦**Auditory Remediation for a Patient with Landau-Kleffner Syndrome: A Case Study (Hurley & Hurley)**

Landau-Kleffner Syndrome (LKS) is a rare, childhood neurological disorder characterized by a sudden or gradual development of acquired aphasia. This case study offers a unique opportunity to assess the changes in the auditory processing ability of a 12 year old male with LKS after two distinct auditory training programs, Fast ForWord® and Dichotic Interaural Intensity Difference (DIID) training. Improvement in the electrophysiological recordings and the behavioral scores from the Dichotic Digits Test are evidence of the plasticity of the central auditory nervous system and may indicate a viable auditory remediation therapy for persons with LKS.

♦**Accommodating Students with Hearing Loss in a Teacher of the Deaf/Hard of Hearing Education Program (Millett)**

This article discusses challenges faced by students with hearing loss at the post-secondary level, and presents a model used in the Teacher of the Deaf/Hard of Hearing Education program at York University in Toronto. This program incorporates concepts of universal design and specific strategies to (1) ensure that students with hearing loss can access both curriculum and practicum as fully and easily as students without hearing loss, and (2) provide opportunities to model appropriate teaching practices. The integration of personal and classroom amplification, architectural classroom design, real-time captioning, audiovisual support, ASL interpreters, and use of online technology is described.

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