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Full Length Research Paper

Skills to optimize the effectiveness of natural teaching moments and to promote the child's reliance on auditory signal

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Hearing loss is the most common congenital disorder in newborns. Children with insufficient access to sound are at considerable risk for speech, language, and academic delays. This pilot study evaluated vocabulary gains over a 5-month period when children with hearing loss in South Vietnam were taught by teachers of the deaf who had participated in a specialized training program provided by the Global Foundation For Children With Hearing Loss to learn effective teaching strategies to promote listening and spoken language development. Results were compared to vocabulary gains of children whose teachers had not participated in the Global Foundation's program. Results of this pilot study demonstrated that children with hearing loss achieve better outcomes when they receive services from well-trained professionals who have the specialized skills and expertise to effectively implement listening and spoken language strategies to optimize language development and educational achievement. The importance of establishing strong infrastructure to support newborn hearing screening, use of advanced hearing technology, and appropriate and intensive early intervention services are also discussed.

Key words: Hearing loss, vocabulary, teacher training, spoken language, Vietnam.

INTRODUCTION

The prosperity of a nation lies in the health and education of its citizens, particularly in the opportunities afforded to children. The world population of children under 18 years of age is estimated at 2.2 billion, with over 90% residing in low- or middle-income countries (United Nations Children‟s Fund (UNICEF), 2008; World Health Organization (WHO), 2012a).

Educational attainment can be a key predictor for economic success in life, including increased potential for employment opportunities and higher earnings (Bloom, 2005; Lleras-Muney, 2005; National Center for Health Statistics, 2012; United States Department of Labor, Bureau of Labor Statistics, 2012). Unfortunately, in a *Lancet* series on the developmental potential of children ages 0 - 5 in low- and middle-income countries, Grantham-McGregor et al. (2007) reported that over 200 million children worldwide are not fulfilling their developmental potential, primarily due to poverty, poor nutrition, and limited access to education.

Children with disabilities are particularly vulnerable to

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insufficient social, medical, and educational services (UNICEF, 2013). In fact, the United Nations Educational, Scientific and Cultural Organization (UNESCO) (n.d.) reported that 98% of children with disabilities in developing countries DO NOT attend school. Yet, research shows that effective educational foundations must begin early in a child‟s life during critical periods of cognitive and linguistic growth (Cole and Flexer, 2011; Sharma et al., 2002; Wasserman, 2007). According to the International Society on Early Intervention (2013), the importance of providing effective early intervention programs, particularly for vulnerable children ages 0 - 3 and their families, constitutes one of the most important challenges for societies and nations.

Hearing loss is the most common congenital disorder in newborns, and later onset of hearing loss affects many more children. The WHO reported that a range of studies and surveys conducted in different countries suggests the incidence of neonatal hearing loss as approximately 0.5 to 5 per 1000 births worldwide (WHO, 2012a). The WHO estimates that of the 360 million persons in the world with hearing loss (that is, 5% of the population), approximately 32 million are children. Unfortunately, the prevalence of hearing loss is substantially greater in low- and middle-income countries than in high-income countries (Stevens et al., 2011). Empirical explanations for this differential are scarce due to poor diagnosis and epidemiological reporting. However, the higher incidence of hearing loss in low- and middle-income countries is likely caused by higher rates of pre- and post-natal infections such as rubella, measles, and meningitis, premature births, poor prenatal care, use of ototoxic drugs, and lack of vaccines (WHO, 2012b). The linguistic, academic, and social impact of hearing loss can be substantial. According to the American Speech and Hearing Association (ASHA) (2013), hearing loss in children can cause: (1) receptive and expressive speech and language delays, including reduced vocabulary development; (2) Adverse impact on academic achievement, primarily due to language and literacy deficits; (3) social isolation and poor self-concept; and (4) fewer vocational options.

With timely and appropriate services from well-trained professionals, children with hearing loss can develop speech and language skills and attain academic achievement at or near their same-aged hearing peers (Kennedy et al., 2006; Moeller, 2000; Robertson, 2009; White, 2006). The Joint Committee on Infant Hearing (JCIH) (2007) issued the recommendation that hearing loss should be confirmed by three months of age, and early intervention services, including placement of appropriate hearing aids, initiated before six months of age. Furthermore, according to the AGBell Academy, child outcomes are positively impacted when teachers: 1) have the skills to identify and optimize the effectiveness of natural teaching moments and to promote the child‟s reliance on the auditory signal, 2) determine appropriate language and academic goals for each child and then effectively organize the educational environment to optimize goals acquisition and progress, and 3) collaborate with parents and other professionals to maximize the child‟s LSL access and their confidence in the ability to communicate with others (Estes, 2010).

Children who are deaf or hard of hearing in Vietnam

Vietnam is a developing country in which early intervention services and educational opportunities for children with hearing loss are a priority (Villa et al., 2003). Epidemiological data are scarce; however, it is estimated as of 2009, there were approximately 180,000 children with hearing loss in Vietnam (General Statistics Office of Vietnam, n.d.; United Nations Population Fund, 2009). Vietnam has an inclusive education policy that includes integrating children with hearing loss into mainstream classrooms with typically-developing peers. However, successful implementation of an inclusive policy requires that children with hearing loss have access to the educational curriculum comparable to their hearing peers. For most deaf or hard of hearing children, this means using appropriately fitted hearing technology, such as digital hearing aids, cochlear implants, and assistive listening devices. Early and consistent access to sound is essential for stimulating auditory pathways for spoken language development. However, simply providing technology is insufficient unless it is accompanied by appropriate rehabilitation and intervention strategies to develop linguistically meaningful auditory input. Children with hearing loss achieve better outcomes when they receive services from well-trained professionals who have the specialized skills and expertise to effectively implement listening and spoken language (LSL) strategies to optimize language development and educational achievement (Estes, 2010; Lenihan, 2010).

Access to hearing technology and professional support throughout Vietnam has improved in recent years, which has enhanced the potential of LSL development in children with hearing loss. For example, in 1997, the United States Agency for International Development (USAID) launched a “children with disabilities” initiative to provide support services for children with special needs (Reilly and Khanh, 2004). USAID awarded grants to Pearl S. Buck International (PSBI) and several other foreign non-governmental organizations. PSBI and its governmental partner, Vietnam National Institute for Educational Sciences, implemented the “Inclusive Education For Hearing-Impaired and Deaf Children in Vietnam” program in six provinces in Vietnam from 2001-2003 (Reilly and Khanh, 2004). The Norwegian Mission Alliance Vietnam Development Program expanded their priorities in 2005 to include implementation of the Inclusive Education project to ensure children and youth with disabilities, including those with hearing loss, can

fully participate within their communities. In 2010, the Global Foundation For Children With Hearing Loss (GFFCWHL), based in Seattle, Washington, launched a comprehensive Deaf Education Program to provide training, materials, and mentoring to early interventionists, educators, therapists, physicians, audio-technicians, and families at 38 schools and 3 hospitals in Vietnam. Their primary focus is to lay the foundation for early identification and intervention services, utilization of appropriate hearing technology, professional training and development, and parent education to improve the spoken language outcomes of children with hearing loss (GFFCWHL, 2013). Concurrently, the Intergenerational Deaf Education Outreach (IDEO) Project, in cooperation with the Ministry of Education and Training and World Concern Development Organization, was implemented in 2011 (World Bank, 2011).

Although progress realized over the past decade is important and encouraging, a shortage of trained educational and audiological professionals continues to impact many children in both urban and rural areas in Vietnam. Shortages of trained professionals exist even in developed countries, and these shortages are substantially exacerbated in low- and middle-income countries. To explore the potential impact on child outcomes when teachers in South Vietnam receive specialized LSL training, this pilot study evaluated vocabulary gains over a 5-month period when children were taught by teachers in their second year of a 5 year curriculum taught by the Global Foundation For Children With Hearing Loss to learn effective LSL teaching strategies as compared to vocabulary gains of children whose teachers had not participated. The pilot study also obtained qualitative questionnaire data from teachers and parents of children with hearing loss.

METHODS

Participants

This study used a comparison group design to evaluate the potential impact on expressive and receptive vocabulary outcomes of 6-7 year old children with hearing loss whose teachers were in the second year of a 5 year Global Foundation For Children With Hearing Loss training program to learn strategies for developing spoken language when compared to children whose teachers did not receive the training. There were 37 children in the experimental group whose teachers were enrolled in the Global Foundation"s training program, consisting of course work and practical experience. There were 39 children in the control group whose teachers were not participants in any type of LSL training program, with cross-sectional assignment to the control group.

The experimental group consisted of four teachers with classrooms ranging from 9 to 12 children per class and the control group consisted of six teachers with classrooms ranging from 9 to 13 children per class. All children in the experimental group and the control group used spoken language as their primary mode of communication.

Vocabulary assessments development

Although a number of standardized assessments are available in English, Spanish, and other languages from developed countries, standardized vocabulary assessments are not available in Vietnamese. Because other standardized assessments are not normed with Vietnamese-speaking samples, utilizing normative data from existing measures to make performance determinations is inappropriate. For this reason, a rudimentary Vietnamese vocabulary assessment was developed for this pilot study. The assessment was not standardized nor did it contain normative data. The stimulus words for the vocabulary assessment were determined according to the input from native Vietnamese professionals. Approximately 120 Vietnamese teachers were asked to identify their recommendations for the top 100 words that Vietnamese children in early primary grades should know. Responses were compiled and the top 45 words (42 nouns and 3 verbs) were selected as the stimulus targets for this study. Photos that were culturally appropriate and pictorially relevant in Vietnam were obtained for each stimulus word.

Assessment administration followed procedures commonly used in standardized vocabulary assessments. During expressive vocabulary administration, the child was shown the picture and asked, “What is this?” Child responses were recorded with a score of „1" if the response was correct and recorded with a score of „0" if the response was incorrect or if the child gave no response. During receptive vocabulary administration, the child was shown 4 pictures and asked to “show me the ___”. The test was scored with „1" if the child pointed to the correct picture and was scored „0" if the child pointed to the incorrect picture or if the child gave no response. The stimulus words for both the expressive and receptive assessments were presented in the same order for each child tested.

Data collection

Baseline expressive and receptive vocabulary data were collected over a two-week period. Two researchers collected all child data for both the experimental and control groups to ensure consistency in test procedures and interpretation. Assessments were administered during the morning hours in a quiet room and children were provided with a drink and small treat upon completion of the test session. In addition, teachers and

Table 1. Descriptives for receptive and expressive vocabulary.

Test-Time	Experimental Group			Control Group		
	Sample size	Mean	S.D	Sample size	Mean	S.D
Receptive Pretest	35	74.7	10.1	32	73.5	15.1
Receptive Posttest	35	84.1	8.2	32	78.4	15.8
Expressive Pretest	36	59.5	16.4	32	53.8	29.5
Expressive Posttest	36	77.7	11.3	32	64.7	25.9

parents completed a questionnaire to obtain data regarding child performance, suggestions, and concerns.

After a period of 5 months during which teachers in the experimental group implemented the teaching strategies learned during training, the expressive and receptive vocabulary assessments were administered again to all participants.

Data analysis

Vocabulary data were analyzed and the results are reported here. First, descriptive and reliability statistics were calculated. Then, a regression analysis was conducted using pretest scores as a covariate. Teachers‟ responses on survey items were analyzed by group. Because survey items had differing scales, a standardized mean difference effect size (SMDES) was calculated for each item, and the SMDES was averaged across items. Finally, a content analysis (Hsieh and Shannon, 2005) was completed on the open-ended comments written by parents on the Parent Survey in response to the inquiry, “What are your primary concerns for your child?”

RESULTS

For receptive vocabulary, the Cronbach‟s alpha measure of internal reliability indicated that the proportion of the variability in item-level scores that was the result of differences between participants was 0.96, which is very high. Group means demonstrated that experimental and control group children were different based on pretest scores, as shown in Table 1. However, the pretest difference was not statistically significant ($f = 0.138$, $p = 0.712$) and averages in both groups increased from pretest to posttest.

For expressive vocabulary, the Cronbach‟s alpha measure of internal reliability indicated that the proportion of the variability in item-level scores that was the result of differences between participants was 0.97, which is very high. Group means demonstrated that experimental and control group children were different based on pretest scores, as shown in Table 1. However, the pretest difference was not statistically significant ($f = 0.981$, $p = 0.326$) and averages in both groups increased from pretest to posttest.

Because initial group means were different but not statistically significantly different, standardized mean difference effect sizes for posttest means were calculated. The effect sizes for differences in posttest scores for receptive and expressive vocabulary were 0.46 and 0.66, respectively, which are both relatively large and potentially important effect sizes.

A regression analysis was used to determine if scores were differentially related to group membership. To account for group differences at pretesting, pretest scores were used as a covariate in the regression analysis. The model for receptive language indicated groups were statistically significantly different ($p < 0.000$). With this model, pretest scores accounted for 48.8% of the variability in posttest scores ($p < 0.001$), while group membership accounted for another 3.1% of the variability ($p = 0.027$) in scores. The partial eta-squared measure of effect size for group membership was 0.074, indicating a small effect size favoring the experimental group. The model for expressive language indicated groups were statistically significantly different ($p < 0.000$). With this model, pretest scores accounted for 49.1% of the variability in posttest scores ($p < 0.001$), while group membership accounted for another 5.3% of the variability ($p = 0.006$) in scores. The partial eta-squared measure of effect size for group membership was 0.110, indicating an effect size favoring the experimental group.

Teacher survey responses were analyzed by group, with sample sizes, means, and standard deviations for each item by group shown in Table 2. Because item responses categories differed among items, the standardized mean difference effect size (SMDES) for each item and the overall average SMDES were calculated. All SMDES favored the experimental group with an average SMDES of 0.84, indicating a substantial difference in language and communication ratings between teachers in the experimental and control groups.

Content analysis was used to examine the open-ended comments written on the parent survey. Content analysis is a research technique for making inferences through objective and systematic analysis of a communication or consumer message (Hsieh and Shannon, 2005; Stemler,

Table 2. Teacher ratings of children‟s language and communication skills.

Survey Item*	Experimental			Control			SMDES
	N	Mean	S.D	N	Mean	S.D	
I) Speaks with teacher in class	38	1.0	0.00	35	0.8	0.43	0.78
I) Speaks with assistants or other teachers	34	1.0	0.17	35	0.4	0.50	1.44
I) Speaks with fellow classmates	37	0.9	0.28	35	0.8	0.41	0.34
II) Language	34	1.9	1.41	34	0.7	0.80	1.03
III) Does the child ask questions?	26	1.7	0.68	34	0.8	0.82	1.22
III) Does the child ask other children to do something?	39	1.3	0.77	35	0.9	0.63	0.63
III) Does the child ask questions when he/she doesn‟t understand?	36	0.8	0.91	34	0.4	0.70	0.55
III) Does the child do anything in order to attract attention?	39	1.6	0.68	35	0.2	0.45	2.38
III) Does the child talk about things he/she sees?	39	1.6	0.55	34	1.1	0.89	0.73
III) Does the child talk about what he/she is thinking or explain anything?	38	1.2	0.82	35	0.5	0.66	0.93
III) Is the child interested in what the other child do and say?	39	1.6	0.64	35	1.3	0.79	0.43
III) Does the child answer questions?	39	1.7	0.53	34	1.3	0.75	0.62
III) Does the child respond to the needs of others?	38	1.7	0.50	35	1.3	0.72	0.69
III) Does the child say anything when he/she has the teacher‟s attention?	37	1.3	0.77	35	0.9	0.93	0.45
III) Does the child verbally agree or accept what the teacher has said?	39	1.4	0.78	35	1.0	0.86	0.40
Average Standardized Mean Difference Effect Size (SMDES)							0.84

* Category I responses were coded as 0=No and 1=Yes.
Category II items were coded on a 5-point scale: 0=No expressive or receptive, 1=Few words, 2=Limited, 3=Mostly proficient, and 4=Proficient. Category III items were coded as 0=No/never, 1=Sometimes, and 2=Yes/always.

2001). In the first step of the analysis, all comments written on the Parent Survey were compiled into one document. Sixty-six comments were recorded, and analysis of the comments revealed commonalities across five primary categories. As shown in Table 3, 95% (n=63) of parents who completed the survey indicated concerns regarding their child‟s speech and language development and their overall ability to engage in effective communication with others. The second category included 14 comments (21%) that described concerns for their child‟s future. The remaining comments described concerns regarding their child‟s age-appropriate development (n=10; 15%); the adequacy of technology their child uses and their ability to effectively access sound (n=10; 15%); and concerns regarding their child‟s social/emotional development and their integration into the community (n=5; 8%). The total does not equal 100% because most parents provided more than one area of concern when answering this question.

DISCUSSION

The results for this pilot study indicate that training and subsequent differences in treatment can have an impact on vocabulary development. While posttest differences were small (though standardized mean difference effect sizes based on posttest means were reasonably large), the study duration was short and all differences favored the treatment group. Furthermore, the Global Foundation For Children With Hearing Loss utilizes a 5-year educational curriculum in which teachers receive instruction in Vietnam each summer and during the school year. A Video Analysis Program ensures continued learning when the Global Foundation team is not in the country. These data were collected during year two of the program when teachers were in relatively early stages of training. Although results of this pilot study demonstrated positive outcomes when teachers use appropriate LSL strategies, additional longitudinal testing will further document the tremendous growth of deaf education services in Vietnam as teachers have become proficient in utilizing LSL strategies in their classrooms. In addition to improved child outcomes, the study also showed that collaborative development of a vocabulary scale to measure growth in vocabulary in countries without standardized measures can provide evidence of vocabulary change over time and increase understanding of the importance of vocabulary development in children with hearing loss.

There is considerable potential for improving language development outcomes in children with hearing loss when teachers have appropriate training to learn effective teaching strategies. Although this pilot study provided just a snapshot of vocabulary gains when children are taught using effective LSL teaching strategies, any gains in language or vocabulary development can exponentially impact other aspects of literacy and academic achievement. According to the findings of the National

Table 3. Content analysis of open-ended comments - Parent questionnaire.

Parent concerns for their child who is deaf or hard of hearing (n=66)		
Content analysis response categories	**Examples of verbatim responses**	**Number of comments**
Communication and language concerns	- Our son is 6 years old and still cannot say what he wants or understand what other people say. - Because our daughter cannot communicate effectively, it has hindered her from expressing her feelings and wishes or responding effectively to others" requests. - Our child can"t say a whole sentence; he can only say one word at a time.	63 (95%)
Worry and concern for child"s future	- We are worried about our child"s future because she cannot speak clearly. - We are really worried that our child can"t get along well with other normal children and the community because he can"t communicate effectively. - We wonder if our child will be able to get a job and be part of our community.	14 (21%)
Age-appropriate development concerns	- I am worried that my child is so delayed that he will not be able to catch up with the other children his age. - We have taken her to doctors and psychologists for evaluations, but we are concerned about her development.	10 (15%)
Continued inadequate access to sound	- I am concerned about the hearing aids because they are not fit properly for her hearing ability.	8 (12%)
Social and community integration concerns	- I wonder if my child can be included in our community as other children. - We are worried about our child making friends, because only parents and teachers can understand her.	5 (8%)

Reading Panel convened by the United States Congress in 1997, vocabulary is one of the five core components of reading instruction to successfully teach children how to read (National Reading Panel, 2000). Vocabulary knowledge is essential to fully express ideas, to communicate effectively, to learn about new concepts, and to improve literacy comprehension (Chall and Jacobs, 2003; Sedita, 2005). Particularly in the early grades, children need to systematically increase their vocabulary knowledge. In fact, Beck et al. (2002) reported that children should add 2,000 to 3,000 new words a year to their reading vocabularies to promote reading with comprehension in later grades. The National Reading Panel (2000: 13) reported, "Reading comprehension is a complex, cognitive process that cannot be understood without a clear description of the role that vocabulary development and vocabulary instruction play in the understanding of what has been read".

Children with hearing loss are at risk for low vocabulary development and poor reading achievement. Although vocabulary gains documented in the present study provided a discreet measure of child performance, vocabulary data encompasses only a small component of the overall focus and emphasis of a comprehensive LSL training program. Teachers must utilize appropriate strategies across a broad range of skill development, such as facilitating and strengthening auditory discrimination and comprehension development, eliciting complex speech and language, and ensuring age-appropriate literacy and academic achievement. Educators with skills to utilize appropriate strategies to promote listening, language, and literacy achievement in children with hearing loss will foster better child outcomes in overall linguistic, academic, and communication potential. The listening and academic foundations acquired during the child"s early, formative years will have a considerable impact on the child"s future performance in upper grades and in their vocational opportunities.

Additional LSL program considerations

Although specialized LSL teacher training programs would provide an important advantage to improving language and academic outcomes, other critical components to successful LSL development for children who are DHH must also be considered. Specifically, implementation of universal newborn hearing screening (Kennedy et al., 2006; Marge and Marge, 2005), use of advanced hearing technology (Cole and Flexer, 2011; Geers et al., 2009), and early intervention programs (Fulcher et al., 2012; Thomasello et al., 2010; White, 2006; Woods, 2008) also provide critical foundations to spoken language development in children who are DHH. Therefore, even though the purpose of this pilot study was to explore the impact of specialized teacher training, additional long-term programmatic enhancements to service delivery infrastructure in these three fundamental areas are essential to creating substantive changes within a developing country to improve outcomes for children with hearing loss.

Universal newborn hearing screening

Infants can be screened for hearing loss within hours of birth using automated test equipment that is harmless and painless to the child (ASHA, 2004; JCIH, 2007; Keppler et al., 2010). The most common method of testing utilizes Otoacoustic Emissions, in which a probe placed in the infant‟s ear canal emits a low-intensity signal to determine if the inner ear structures respond to the sound (NCHAM, 2011). Unfortunately, in many low- and middle-income countries, the development and implementation of newborn hearing screening programs can be daunting due to cost and infrastructure barriers (McPherson, 2012). In some regions, including Vietnam, newborn hearing screening is completed exclusively on infants who are considered high risk for hearing loss (for example, family history, maternal infections during pregnancy or delivery, administration of ototoxic medications, prematurity, hyperbilirubinemia). Although these programs are better than no screening at all, many babies with permanent hearing loss will be missed using only a high-risk screening protocol. Of the 12,000 babies in the United States born annually with some form of hearing loss, only half exhibit a risk factor - meaning that if only high-risk infants are screened, half of the infants with some form of hearing loss will not be tested and identified (Harrison and Roush, 1996). In the United Kingdom, newborn hearing screening has been offered since 2001 and, as of March 2013, over 98% of newborns were screened for hearing loss. According to Public Health England (2013), there are approximately 900 children born each year in the UK with significant permanent hearing loss. Before the availability of the UK Newborn Hearing Screening Programme, Public Health England projected that approximately 400 of these children would have gone undetected at 1½ years of age and about 200 of these children at 3½ years of age. In an independent evaluation of newborn hearing screening programs in England, Uus and Bamford (2006) concluded that very few babies were missed in hearing screening and that when properly implemented, a newborn hearing screening program based on whole populations and routine service provision facilitates timely identification and intervention.

Although the implementation of newborn hearing screening programs in developed economies throughout the world has demonstrated positive outcomes for children, the implementation of newborn hearing screening programs in low- and middle-income countries is more complex. Access to screening technology can be expensive to access, trained personnel are typically scarce, and births outside of a hospital or clinical setting are common (McPherson and Brouillette, 2011). Even when newborn hearing screening programs are accessible, there is often great variation within individual countries. According to WHO (2009), the reasons for variability in screening implementation are not always financial, nor is it always about technological access. Some wealthy countries have fragmented and ineffective programs, while a number of less-wealthy countries have very successful programs. Equally important is the development of appropriate systemic infrastructure to support individuals, families, and service providers, including access to education and training to inform professional services, parental choice, and cultural perceptions. In some countries, great progress has been made in a relatively short period of time, while in others, progress has been impeded by cultural, educational, systemic, logistical, or financial barriers.

Advanced hearing technology

Many children who are born with hearing loss use sign language for communication, an important linguistic option. However, due to the availability of better hearing technology and earlier identification, an unprecedented number of infants are being fitted with hearing aids as young as four weeks of age. Hearing aids are the most commonly used technology for children who are DHH because they are appropriate for most types and degree of hearing loss (ASHA, 2011). Nonetheless, even with advances in hearing aid technology, the successful use of a hearing aid requires at least some residual hearing. For children with little or no residual hearing who do not benefit from hearing aids, cochlear implants may be the technology of choice for accessing sound. A cochlear implant differs from a hearing aid because rather than amplifying sounds to make them louder, the cochlear implant captures sound, and then using complex algorithmic processing, stimulates the auditory nerve to

send signals into the auditory centers of the brain. The cochlear implant user must learn how to utilize this input so that sounds become linguistically meaningful for the development of spoken language. According to the National Institute on Deafness and Other Communication Disorders (NIDCD), nearly 30,000 children in the United States have received cochlear implants, with many children receiving them prior to their first birthday (NIDCD, 2009; Holt and Svirsky, 2008). Improvements in technology have resulted in dramatically improved success in communication, language acquisition, and academic skill development for educational achievement in mainstream classroom settings (Cole and Flexer, 2011; Geers et al., 2009; Robertson, 2009).

Early intervention services

Although early identification and use of appropriate hearing technology are critical foundations for developing spoken language skills, the benefits of early diagnosis are optimized when prompt and effective early intervention services are implemented before 6 months of age (JCIH, 2007; Vohr et al., 2012). Age-appropriate speech and language development is not a certainty for all children, even with early services. However, research has shown that children with hearing loss significantly benefit from timely specialized training, with many children developing listening and spoken language skills similar to their same-aged hearing peers (Moog and Geers, 2003; Kennedy et al., 2006; Moeller, 2000; Nicholas and Geers, 2007; Yoshinaga-Itano et al., 1998).

SUMMARY

The primary reason parents elect to have their child use hearing aids or cochlear implants is the potential that their child will develop the LSL skills necessary to become more successful within social and educational systems that rely on spoken language. However, such success is dependent on having an efficient infrastructure and implementation of early hearing screening services, access to appropriate technology, and professionals who are well trained in the specialized auditory skills, hearing technology, and teaching strategies necessary for optimal child outcomes (Estes, 2010; Lenihan, 2010). Even children who are not identified early can benefit from teachers who have the skills and knowledge to facilitate greater language and academic achievement using appropriate LSL strategies. As this pilot study showed, training teachers to implement LSL strategies for vocabulary development results in measureable gains in vocabulary when compared to a group of teachers who do not learn LSL strategies. The developmental potential of children with hearing loss in low- and middle-income countries is significant if appropriate supports are available within education and social infrastructure.

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