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Editors’ Preface

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For over 110 years, *The Volta Review* has provided scientific evidence to support professionals and families seeking a spoken language outcome for children with hearing loss. To ensure the journal’s esteem in the eyes of its readers, we recently conducted a survey to gauge the attitudes, opinions, and expectations of the journal’s audience. The results were surprising in some respects, and validating in others.

Overall, 70% of respondents rated the quality of content in *The Volta Review* highly. Singled out positively were both the range of topics the journal covers and the overall quality of writing. The majority of respondents wanted to see topics such as auditory (re)habilitation, early intervention, and language and literacy development, but did not indicate a high interest in research on manual communication, causes of hearing loss, or unilateral hearing studies. In addition, the same categories that readers indicated high interest in also received high marks for availability. Therefore, not only is there clear interest in specific topics of research, but those topics are already being studied and focused on.

In addition to the research topics and availability, an overwhelming 71% of readers agreed that the research influenced how they dealt with hearing loss and spoken language development issues among children and families. As one respondent noted, “I base my practice on evidence, and families often like knowing that ideas they have not come across before have evidential basis.” These results indicate that *The Volta Review* is highly valued among its readers and influential among those making decisions regarding hearing loss and communication outcomes.

The data gathered from this survey will help us continue to improve and expand the journal’s content. One of the reasons *The Volta Review* has such a long-lasting legacy is its ability to recruit high-quality manuscripts from emerging and established authorities in the field. Respondents to the survey noted that the most effective way to recruit manuscripts is through personal
interaction, (whether in a group setting like a workshop, or communication from a friend or advocate of *The Volta Review*). Therefore, as a loyal reader of the journal, we ask you to help us spread the word about the journal and its place in the field. *The Volta Review* is currently accepting a wide range of manuscripts, including both quantitative and qualitative studies, case studies, literature reviews, commentaries, and book reviews. With a new web presence and online archives as well as an exciting monograph on professional preparation dropping in June 2010, the journal is rapidly increasing its visibility in and beyond the field of hearing loss and spoken language communication. Don’t miss being a part of this prestigious legacy.

This issue contains some important research concerning FM systems and hearing aid compatibility, strategies for maximizing the potential of individuals with hearing loss, and a frank and honest commentary on how the community labels individuals who are deaf as well as those with typical hearing. We hope you enjoy this issue, and please don’t hesitate to contribute to *The Volta Review*.

Sincerely,

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Psychosocial Potential Maximization: A Framework of Proactive Psychosocial Attributes and Tactics Used by Individuals who are Deaf

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This article presents a systematic and comprehensive framework of proactive psychosocial attributes and tactics that individuals who are deaf use to maximize their professional and social potential. Empirical studies regarding deafness appear to lack such a framework which may be due to how the research is conducted. A framework of proactive psychosocial attributes and tactics was found in Reiff, Ginsberg, and Gerber’s (1995) study of learning disabilities. Reiff et al.’s framework was thereafter used to frame a review of empirical studies related to deafness. It was found that individuals who are deaf likely maximize their potential using 2 sets of proactive psychosocial attributes and tactics: (1) skills that individuals with typical hearing use and (2) specialized skills for circumventing deafness-related difficulties. It is further argued that adult participants who are deaf will provide greater insight into how psychosocial potential is maximized. This literature review will be complemented by empirical findings in a later article.

Introduction

Research related to deafness appears to lack a systematic and comprehensive framework of proactive psychosocial attributes and tactics that adults who are deaf use to maximize their professional and social potential. Authors have argued that while much instructional classroom time with students who are deaf has been focused on academic subjects and the improvement of language...
and speech skills, the curriculum generally does not cover the development of proactive psychosocial skills (Bowe, 2003; Calderon & Greenberg, 2000). Mental health professionals have further anecdotally observed low levels of psychosocial competence in adults who are deaf (Bowe, 2003; Harvey, 1998). Many educators of the deaf and other deafness-related professionals may also be graduating from training programs unable to foster their students’ or clients’ psychosocial potential (Bowe, 2003; Calderon & Greenberg, 2003). These serious issues have occurred despite numerous autobiographical accounts attesting to the professional and social integration of individuals who are deaf (e.g., Jacobs, 2007; Reisler, 2002).

The aim of this article is to define a systematic and comprehensive framework of proactive psychosocial attributes and tactics that adults who are deaf use to maximize their professional and social potential. This specified area of academic inquiry involved four separate surveys of the literature that are outlined in this article. These investigations involved the analysis and synthesis of literature in multiple academic domains including epistemology, social psychology, humanistic psychology, emotional intelligence, learning disabilities, deafness, and education. This literature review formed the basis of a doctorate dissertation completed at the University of Melbourne, Australia, in May 2009.

At the outset, it is important to define psychosocial attributes and tactics. Maslow (1970) defined psychosocial attributes as an individual’s cognitive traits and thought processes. Sternberg (1985, 1988) further theorized that psychosocial tactics are behavioral outcomes caused by the individual’s cognitive attributes. Psychosocial attributes and tactics are largely distinct from IQ (or academic intelligence) and linguistic competence (Maslow, 1970; Sternberg, 1985). The individual’s ability to execute a range of proactive psychosocial attributes and tactics is closely linked with Sternberg’s (1985, 1988) concept of “tactic knowledge.” Tactic knowledge, or knowledge of psychosocial tactics, connotes the individual’s understanding of and executing appropriate or productive responses to social, practical, or emotional problems (Sternberg, 1985). Tactic knowledge is, it will be argued, an important component of Psychosocial Potential Maximization.

The phrase *Psychosocial Potential Maximization* defines a collective noun, or more specifically a comprehensive and systematic framework of proactive psychosocial attributes and tactics that individuals who are deaf can use to maximize their professional and social potential. The Psychosocial Potential Maximization framework presented in this article has adopted, refined, and renamed a framework presented in a qualitative study by Reiff, Ginsberg, and Gerber (1995). Their framework was substantiated by findings gleaned from in-depth interviews with 71 adults who had achieved professional and social success despite their learning disability (LD). The discovery of Reiff et al.’s framework occurred after an initial survey of the literature related to deafness. This search found that empirical studies appeared to lack a comprehensive
and systematic framework of proactive psychosocial attributes and tactics that adults who are deaf use to maximize their social and professional potential. A test instrument also appeared to be missing. A plausible reason for these notable absences may be related to how academics studying deafness have framed their research. Exploring these research issues provide an instrumental foundation upon which Reiff et al.'s framework can thereafter be employed in a deafness context.

A synthesis of this initial literature search found four general topics of investigation. First, much attention has been devoted to describing the cognitive and spoken language competencies of participants who are deaf. Second, researchers have tended to measure the effectiveness of sensory aids or rehabilitative interventions to remedy anomalies that may be related to deafness. Third, many studies and texts have focused on identity (e.g., cultural Deafness) to analyze and suggest ways to remove structural barriers in society (e.g., between people who are deaf and people who have typical hearing). Fourth, much research has emphasized the linguistic and cultural significance of Sign Language (SL) (see Corker, 1998; Lane, 1993). At the risk of overgeneralization, the first two aforementioned topics of investigation appear to be conducted within a medical model paradigm that tends to view deafness as pathology. A paradigm defines a framework containing specific methodological principles of how research is conducted (Kuhn, 1962). An example of the medical model as pathology is identifying atypical behaviors or auditory characteristics in participants who are deaf and then assisting them with auditory technology, speech/auditory training, or/and educational intervention (Muma & Teller, 2001). Further, the third and fourth aforementioned topics of investigation appear to be linked to a social model paradigm. A practical example of the social model is the provision of SL interpreters, a consequence of legislative outcomes for inclusion to accommodate the needs of some individuals who are deaf (Bain, Scott, & Steinberg, 2004).

None of the four observed research trends, however, are specifically focused on how adult participants who are deaf maximize their social and professional potential using proactive psychosocial attributes and tactics. It was additionally found that the overwhelming majority of deafness-related studies focused primarily on juvenile and not adult participants. Given these context- and demographic-specific factors, a second survey of the literature was deemed necessary. This search for a comprehensive and systematic framework of proactive psychosocial attributes and tactics in adult participants was conducted outside the academic domain of deafness. This investigation discovered innovative research into how participants with an LD use proactive psychosocial attributes and tactics to achieve optimal social participation. This particular focus has been made possible by a paradigm shift toward the Risk and Resilience (R&R) model (Reiff, 2004; Wong, 2003). The R&R model does not focus on the concept of a disability as pathology or how societal barriers may influence the quality of life for people with disabilities. The R&R model
is inherently psychosocial and views the concept of disability as a workable or tangible psychosocial phenomenon (Reiff, 2004). Researchers have therefore sought to discover what participants with an LD can do, rather than what they cannot do, through active risk and resilience (Reiff, 2004; Wong, 2003).

Reiff et al.’s (1995) study with professionally successful participants with an LD employed the methodological principles of the R&R model. More specifically, their framework demonstrated how individuals execute proactive psychosocial attributes and tactics. Furthermore, Reiff et al. purposefully recruited adult participants. A plausible supposition for this recruitment strategy is the positive educational quality within studies framed by the R&R model (Reiff, 2004; Wong, 2003). As such, the strength-based findings of psychosocial attributes and tactics among adult participants with an LD are disseminated to inform the education of younger persons with an LD. These research paradigm issues, combined with the disability and psychosocial contexts, indicated that Reiff et al.’s framework was worthy of scrutiny in a deafness setting.

**Eight Proactive Psychosocial Attributes and Tactics**

Reiff et al.’s (1995) framework consists of eight psychosocial themes that are allocated to two thematic categories: Internal Decisions and External Manifestations. Internal Decisions are cognitive attributes, which consist of Desire, Goal Orientation, and Reframing. An individual’s Internal Decisions cause External Manifestations, which are the outwardly evidential behavioral tactics of Persistence, Goodness of Fit, Learned Creativity, and Social Ecologies. Reiff et al.’s eighth theme was Control, the overarching theme that also contributes to the seven other themes. Figure 1 shows Reiff et al.’s framework as conceptualized by the author of the current article.

Reiff et al.’s (1995) framework is not hierarchical. The thematic categories of Control, Internal Decisions, and External Manifestations have a reciprocal influence on each other. The eight themes are therefore not mutually exclusive. The individual also executes these proactive psychosocial attributes and tactics in professional and social settings through purposeful risk-taking and resilience. Although it was created in an LD context, Reiff et al.’s framework was deemed as having strong potential to frame a review of empirical research related to deafness.

A systematic review using Reiff et al.’s (1995) eight psychosocial themes as search terms was then conducted in databases to source studies with adult participants who were deaf. This search yielded an insufficient number of relevant studies to create a substantiated review of deafness literature with Reiff et al.’s framework. Another search, the fourth overall in this project, was thereafter conducted. This exploratory search was guided by two stringent criteria to assess the suitability of applying Reiff et al.’s framework in a deafness
context. First, the review excluded studies involving child participants and focused primarily on studies with adult participants. Studies into deafness featuring adolescent participants were, however, included when there was an absence of studies with adult participants specifically related to a theme. Second, preference was given to studies focusing on the execution of proactive as opposed to negative psychosocial attributes and tactics. These two justifications are linked intrinsically with the research objectives of the R&R model. The suitability of Reiff et al.’s framework was further substantiated by research unrelated to disability regarding the execution of proactive psychosocial attributes and tactics (e.g., Bloom, 1982). The following review therefore reports Reiff et al.’s findings, some miscellaneous research unrelated to disability, and then connects empirical studies featuring participants who were deaf with each of the eight themes. Control will be reviewed first because it overarches all the other themes (see Figure 1).

*Control*

Control as the outcome of the seven themes can be termed autonomy. Maslow (1970) stated “autonomy is self-decision, self-government, being an
active, responsible, self-disciplined, deciding agent rather than a pawn, or helplessly ‘determined’ by others” (pp.161). The notion of an individual controlling his/her destiny has strong links with Rotter’s (1966) notion of Locus of Control. Rotter theorized that individuals with external locus of control believe and behave in a manner whereby their fate is determined by external forces/chances. Contrariwise, individuals with internal locus of control believe and behave in a manner whereby their destinies are self-determined.

By engaging in a purposeful process of self-actualization, participants in Reiff et al.’s (1995) study believed they were able to determine outcomes rather than being passively resigned to extrinsic lifestyle influences. Control was apparent in the participants’ proactive management of life circumstances and also their acceptance of disability-related challenges as alterable and not fixed. These findings were further supported by Reiff’s (2004) later study that used Reiff et al.’s framework with 21 college students with LDs. Participants in Reiff’s (2004) study who demonstrated high internal locus of control reported a greater sense of academic and social mastery than did participants who saw their disability as unchangeable or environmentally/externally determined.

Acceptance of deafness can be interpreted in two ways. First, Reiff et al. (1995) stressed the importance of individuals accepting that their LD poses psychosocial challenges. An individual’s acknowledgement of psychosocial difficulties related to deafness is therefore required to master and execute Reiff et al.’s psychosocial themes. The second interpretation may be that individuals who do not accept cultural Deafness are in denial of their deafness (see Lane, 1993). Given this, the first interpretation is inherently psychosocial and more aligned with Rotter’s (1966) notion of internal locus of control than the second interpretation.

According to Scheetz (2004), the tendency toward external locus of control in some individuals who are deaf may be a consequence of socialization in residential schools for the deaf and in Deaf communities where a group mindset is valued over individualism. Individualism places a premium on autonomy. It also suggests that individuals are compelled to make lifestyle choices and are solely responsible for maximizing their psychosocial potential (Beck, 1992; Giddens, 1991). However, as Fromm (1960) argued, some individuals may find self-responsibility too overwhelming and may resort to mechanisms of escape, such as automation conformity – the uncritical acceptance of and adherence to an organization’s or community’s norms, values, and beliefs. An example of a group mindset is Kormesaroff and McLean’s (2006) anecdotal statement that people who identify as culturally Deaf (CD) are oppressed by people with typical hearing, “with whom they do not identify and who do not identify with them” (pp. 91). Corker (1998) and Lane (1993) express similar beliefs, implying that CD individuals are exempt from responsibility for initiating and sustaining relationships with peers who have typical hearing.

Groupthink in a deafness context was reported in Stinson, Liu, Saur, and Long’s (1996) study of communication and social relationships for 50 Rochester
Institute of Technology/National Technical Institute for the Deaf (RIT/NTID) students who were deaf. Study participants involved in mainstream activities had strong feelings of emotional security, social competence, self-confidence, and social connectedness with their peers with typical hearing. In contrast, other studies have reported that participants who were deaf and who lacked social competence, self-confidence, and social connectedness with peers with typical hearing are more likely to socialize with peers who are deaf (e.g., Musselman, Mootilal, & MacKay, 1996; Stinson, Whitmire, & Kluwin, 1996).

In addition, Greenberg and Kuschè (1993) defined outcomes and processes that promote psychosocial development in children who are deaf. Psychosocial competencies related to Control in mainstream settings included good communication skills; the ability to think independently; an aptitude for self-control and self-direction; the ability to understand the needs, feelings, and motivations of others and oneself; flexibility in managing and adapting to multiple perspectives in any given situation; the ability to rely on others and to be reliable; a capacity for appreciating and understanding the values of both one’s own and other cultures; and, finally, the ability to use these skilled attributes to achieve socially appropriate goals and maintain healthy relationships of varying degrees of intimacy. Greenberg and Kuschè’s views are evident in studies reporting that participants who were deaf and have a strong internal locus of control achieve higher academic outcomes, act more independently, and feel less depressed than do participants with a tendency toward external locus of control (e.g., Foster & MacLeod, 2004; Stinson & Antia, 1999).

Desire

Desire is the cognitive drive that motivates individuals to achieve productive psychosocial outcomes. Many participants in Reiff et al.’s (1995) study reported that anger originating from incidents in childhood, particularly anger toward the school system, was a catalyst for what would later become successful professional and social outcomes. Other participants maintained their Desire into adulthood through rewards gained from particular endeavors, encouragement from significant others (e.g., family and teachers), or understanding that basic academic survival required sustained determination. Many participants also appeared determined to prove the stereotypes of their disability wrong (e.g., low expectations imposed by others) and that these external influences would not decide their fate.

Aspects of Desire were investigated in Bloom’s (1982) retrospective study with 25 participants without a disability who had achieved world-class accomplishments before the age of 35. Reiff et al. (1995) cited Bloom’s work as a significant influence on their own research. Participants in Bloom’s study included elite concert pianists, sculptors, mathematicians, neurologists, Olympic swimmers, and tennis players. Participants showed an extraordinary willingness to devote their time and effort to refining their skills through practice. They
also demonstrated an inordinate competitiveness and a determination to maximize their potential. Industry to achieve a high standard was evident in their early years and became increasingly evident after several years of instruction. Bloom suggested that industrious commitment was crucial to allow the participants to continue reaping rewards and realizing their aspirations.

Luckner and Muir (2001), Bain et al. (2004), and Toscano, McKee, and Lepoutre (2002) have all provided deafness-specific examples of Desire. Luckner and Muir’s study sought to understand the attributes of 20 academically successful mainstreamed students who were deaf. The study also included interview data from 19 parents, 19 general education teachers, and 13 teachers of the deaf. The parents in this study reported that their children did not want to be treated differently than their peers with typical hearing. These students also sought recognition for scholarly efforts (e.g., awards, certificates, and high grades). The educators further observed that the students had a sense of belonging among peers with typical hearing and lacked social inhibition regarding their deafness. These students further demonstrated self-advocacy skills and a strong internal drive to be independent.

Bain et al.’s (2004) study featured 38 non-signing adults who were deaf and who were highly educated, socially connected, and professionally successful. The majority of participants had developed psychosocial strategies to negotiate social difficulties related to deafness, including the Desire to educate others about deafness and adapt to the needs of others by participating in activities and maintaining a lifestyle similar to peers with typical hearing. Participants also expressed self-confidence, little social anxiety, and pride in their strategic adaptive skills. Additional findings related to Desire included the participants’ motivation to improve speech-reading skills, to enunciate speech more clearly, and to initiate modifications in their environment to ensure ease of communication.

Toscano et al. (2002) sought to identify characteristics and factors related to academic success in 30 RIT/NTID students who were deaf and who exhibited exemplary writing and reading skills. This study reported that the participants had received intensive encouragement and tutoring from teachers and family, and they believed that watching captioned media and using text-based telecommunications had improved their reading and writing skills. A significant finding was that many of the participants reported a love for reading and writing from a young age. The previously mentioned study by Bloom (1982) also reported that high achievers without a disability exhibited ongoing enjoyment of a craft or life pursuit.

**Goal Orientation**

Goal Orientation is a cognitive strategy that involves an individual’s purposeful pursuit of professional or social objectives. Reiff et al. (1995) suggested that goals for a person with an LD cannot be vague or unrealistic. Unrealistic
goals were correlated with a lack of career choice awareness, which can lead to adverse outcomes. Proactive Goal Orientation was defined as a planned series of progressive steps. As one participant stated, “Successful people have a plan. You have to have a plan, goals, strategies; otherwise you are flying through the clouds and then you hit the mountains” (pp. 33, Reiff et al., 1995). Participants reported that realistic aspirations and achievable short-term goals created feelings of purposefulness and prevented helplessness.

Goal Orientation was a feature of Luckner and Muir’s (2001) study with academically successful students who were deaf. The parents in this study described their children as organized, self-motivated, responsible, goal directed, and diligent. Similar attributes were reported in Menchel’s (1995) doctoral dissertation regarding interviews with 33 academically successful participants who were deaf and who attended 18 mainstream American universities. Speech-reading and speech were the primary communication modes for all but one participant. The participants were highly goal oriented, socially and academically integrated, and demonstrated strong problem-solving skills.

The attainment of educational qualifications by individuals who are deaf is an example of career-based, goal-oriented behavior. In a review of demographic statistics, Jones (2004) cross-referenced Schroedel and Geyer’s (2000) study with information about the general hearing population provided by the U.S. Department of Commerce in 1999. Schroedel and Geyer’s study researched 240 participants who were deaf who had graduated from RIT/NTID between 1983 and 1985. At a time when 90% of people without disabilities were employed, 85% of the graduates who were deaf were in the labor force. Jones reported that the overall median wage for males was $35,962 (USD), which was almost identical to the median wage of Schroedel and Geyer’s nonrandom sample of 110 males ($35,880 [USD]) (Jones, 2004; Schroedel & Geyer, 2000).

With respect to Goal Orientation, Schroedel and Geyer (2000) recommended on the basis of their findings that individuals who are deaf need to set long-term goals at an early age (i.e., ninth grade) and be guided by career counselors before college or workforce entry. Individuals who are deaf are also advised to think in terms of a career rather than a specific job and to work in a sequence of relevant jobs to become professionally diverse. Schroedel and Geyer additionally emphasized the value of purposefully enhancing interpersonal skills, reading and writing skills, and career-relevant technical expertise.

Reframing

Reframing can have two meanings. First is the researchers’ interest in how individuals circumvent disability-related challenges rather than focusing on negative aspects of a disability (Reiff, 2004). The second meaning refers to how an individual cognitively reframes dysfunctional or irrational beliefs (i.e., self-talk) to produce proactive psychosocial outcomes (Ellis & Harper, 1977; Jacobs, 2006; Reiff, 2004).
Participants in Reiff et al.’s (1995) study provided examples of Reframing when they shifted attention away from personal weaknesses/negatives and toward strengths/positives. For example, one participant explained that being ashamed of an LD can impede psychosocial competence. Acknowledging the disability and its specific psychosocial challenges are characteristic of some cognitive tactics central to Reframing. Another participant explained, “I have learned to accept who I am, what I can do, what I cannot do, who I should not try to be, and who I should try to be” (pp. 33, Rieff et al., 1995). Reframing occurred when this participant shifted the focus from a cannot do to a can do cognitive outlook.

Evaluation is crucial for Reframing because dysfunctional behaviors must be acknowledged before they can be monitored and changed (Ellis & Harper, 1977). Reframing involves assessing negative expectations or stereotypes that can cause individuals who are deaf to develop learned helplessness and limit their personal goals. For example, Bibby, Beattie, and Bruce’s (1996) findings suggest that individuals who are deaf are better able to implement different coping strategies when they are aware of the psychosocial difficulties related to deafness.

Punch, Creed, and Hyde’s (2005) study revealed that 65 non-signing student participants who were deaf had more realistic outlooks and achievable career goals than 107 student participants who had typical hearing. The participants who were deaf had clearly reframed possible negative or unrealistic career outcomes and focused on proactive or realistic outcomes. Punch et al.’s measures were of perceived career barriers, career indecision, and career maturity. The findings indicated that the participants who were deaf had parents who had purposefully directed them toward occupations where their strengths would be optimized and their weaknesses minimized. The understanding that deafness can cause limitations helped them understand and circumvent possible career barriers and potential adverse career outcomes. Negative aspects of deafness were therefore cognitively reframed in a proactive manner.

In summary, findings related to Reframing suggest that poor self-esteem and social exclusion are not produced solely by societal barriers or external locus of control. Rather, the individual’s own capacity for Reframing may have a significant role in maximizing his or her psychosocial potential.

**Persistence**

The affective tactic of Persistence requires an individual to take risks and demonstrate resilience over time. Working hard was not a temporary pursuit for many participants in Reiff et al.’s (1995) study; rather, it reflected their ability to deal with perpetual adversity. Upon reflection on living with an LD, one participant said, “I have learned persistence and am surprised by the number of people who lack persistence” (pp. 34, Rieff et al., 1995). Another participant indicated that Persistence can lead to professional and social success despite
a disability: “There is always a place for someone who wants to work hard because most people in the world don’t want to work at all” (pp. 34, Rieff et al., 1995).

Research unrelated to disabilities, such as that of Bloom (1982) and Ericsson, Charness, Feltoovich, and Hoffman (2006), note that an individual’s psychological attachment to his or her profession distinguished the elite from the very good practitioners in various fields of expertise. The psychological attachment of proactive individuals who are deaf to their professional and social goals may therefore be more symptomatic of Persistence than that of less proactive individuals who are deaf.

Bibby et al.’s (1996) study with 58 adults with acquired deafness analyzed the link between language competence and coping strategies. Some participants believed that risk-taking led to the eventual mastery of psychosocial skills. Tactics of Persistence included refusing to withdraw, being willing to rebuild one’s life, and asserting one’s conversational needs despite difficulties. Similar results were reported in Kersting’s (1997) study with 10 RIT/NTID students who were deaf who found that maintaining relationships with their peers with typical hearing was difficult. There were reports from participants in Kersting’s study, however, that persisting through experiences of loneliness and rejection eventually produced intimate relationships (e.g., romantic partnerships or best friends) and overall feelings of connectedness with peers who had typical hearing.

Studies have further reported that non-signing adults who are deaf tend to be more assertive or persistent with peers with typical hearing than those who use mixed (speech and signing) or SL-only communication modalities. Examples of assertiveness include asking peers to speak more clearly (Reisler, 2002), making others feel comfortable with deafness (Bain et al., 2004), and altering the physical environment to facilitate speech-reading (Bain et al., 2004). Assertive strategies are a form of self-advocacy because educating peers with typical hearing requires facilitating communication and forestalling possible negative outcomes with strangers or friends (Stinson, Liu, et al., 1996).

**Goodness of Fit**

Goodness of Fit is a behavioral outcome that involves an individual’s purposeful placement in environments in which proactive professional or social outcomes are likely. It can also include the deliberate avoidance of, or minimal entry into, social environments where proactive outcomes are unlikely. Remaining in a relationship, occupation, or circumstance that exposes an individual’s weaknesses may reduce the likelihood of Psychosocial Potential Maximization (Reiff et al., 1995; Sternberg, 1988). Reiff et al.’s participants chose careers wisely and pursued work environments in which their strengths would be optimized and their weaknesses minimized. Professional success also depended on achieving a balance between adjustment skills (e.g., using
spelling aids) and the responsiveness of work/social environments to accommodate disability-related needs.

In a deafness context, Musselman et al. (1996) studied the social orientation and adjustment of 71 adolescent participants who were deaf in segregated (n = 39), partially mainstream (n = 17), and mainstream (n = 15) educational settings. For comparison purposes, 88 adolescents with typical hearing from several suburban high schools also participated in this study. Findings showed that the participants who were segregated had poorer spoken English and lower measures on scores of English language skills (i.e., simultaneous communication and verbal IQ) than the other participants. Despite good SL skills in the segregated group, poorer social adjustment with peers who had typical hearing was consistent with the segregated participants’ poorer spoken and English language skills. Partially mainstreamed participants had measured levels of SL competence similar to those of the segregated participants but better scores on the measures of spoken English skills. The mainstreamed group had better spoken English skills than the other two groups defined by deafness, but comparatively poorer SL skills. Overall, segregated and partially mainstreamed participants reported better adjustment and perceived social competence with peers who were deaf and who shared their communication modality and, presumably, cultural values. Other studies have reported similar findings (e.g., Stinson, Liu, et al., 1996; Stinson, Whitmire, et al., 1996). The mainstreamed participants who were deaf in Musselman et al.’s study, however, reported better adjustment and perceived social competence with peers who had typical hearing than the other groups who were deaf and defined by their educational placement. The mainstreamed participants also reported a level of social adjustment equal to that of the participants with typical hearing.

Stinson, Liu, et al.’s (1996) study further found that non-signing adult participants who were deaf were better able to receive and impart a greater quantity and quality of information with peers with typical hearing than with users of mixed or SL-only communication. Other studies have shown non-signing participants’ reluctance or refusal to participate with individuals who were deaf using a mixed modality or SL only. Reasons included the slow instruction pace in deaf-only classrooms (Stinson, Liu, et al., 1996), a perceived lack of intelligence in deaf-only settings (Bain et al., 2004), dislike of Deaf culture politics (Jacobs, 2004), and a preference for pursuing relationships with peers who had typical hearing that shared their values and beliefs (Kersting, 1997).

Self-esteem and coping strategies may also influence a Goodness of Fit for individuals who are deaf with peers who are either deaf or who have typical hearing, or both. Jambor and Elliott’s (2005) study investigated self-esteem and coping strategies in 78 adults who were deaf. This study yielded three interesting findings. First, participants with profound deafness had higher ratings of self-esteem than did participants with less severe deafness. The authors suspected that participants who were profoundly deaf were more accepting of
their deafness and more knowledgeable about specific coping strategies used to counteract difficulties related to deafness. Second, group identification with the CD and withdrawal into the Deaf community correlated with positive self-esteem. The authors believed the protective factor, or “security base,” of the Deaf community was a reason for this Goodness of Fit. Muma and Teller (2001) and Scheetz (2004) described this withdrawal as CD individuals escaping the demands of individualism by remaining within the Deaf community and not venturing out of this security base. Third, bicultural participants who socialized in both the hearing and Deaf communities tended to have higher self-esteem than either non-signing or CD participants who were deaf. Jambor and Elliott perceived these participants as benefiting from having peers who either had typical hearing or who were deaf.

However, some of these findings related to Goodness of Fit were not supported by Polat’s (2003) study with 1,097 elementary and secondary students from 34 Turkish schools who were deaf. This study of psychosocial adjustment found seven common factors of statistically significant value. First, Polat found that an additional disability adversely affected the self-image as well as the emotional and social adjustment of participants who were deaf. An additional disability was more likely to be found in participants educated in segregated rather than in mainstreamed settings (Polat, 2003). Second, the more severe the hearing loss, the greater difficulty the participant had adjusting, which contradicts findings in other studies (e.g., Hyde & Power, 2004; Jambor & Elliott, 2005). Third, Polat reported that the later the onset of deafness, the poorer the participant’s psychosocial adjustment. Fourth, older students were rated as better adjusted by their teachers compared with younger students. Fifth, greater speech intelligibility was positively associated with greater psychosocial adjustment. Sixth, students who performed best academically were better adjusted than those who performed poorly. And finally, hearing aid use was positively associated with academic performance and social adjustment.

Learned Creativity

Learned Creativity involves an individual’s ability to use learned skills creatively to generate career and social outcomes. Learned Creativity can have two components: learning from others and purposeful self-learning. Creativity suggests skillfully using multiple learned techniques to circumvent disability-related challenges.

Participants in Reiff et al.’s (1995) study had acquired individualized and specialized coping strategies that enabled them to succeed in circumstances previously deemed overwhelming. Reiff et al. used the term “manipulation” to describe how individuals adapt to, alter, or choose environments that align with their abilities and needs. Manipulation involves acting on a proactive analysis of circumstances, recognizing that many events cannot be controlled because of one’s disability. As one participant, who had become a high-ranking
business executive despite his LD, explained, “I had to find another way. And in that process, I ended up going through parts of the maze that nobody had ever seen” (pp. 35, Reiff et al., 1995). Creative thinking not only helped this participant achieve social inclusion, it also helped produce beneficial career outcomes.

Learned Creativity also involves what Reiff et al. (1995) called “prostheses” to circumvent disability-related difficulties (e.g., spelling aids to help with writing, maintenance logs to regulate living demands, and book tapes to accelerate reading competence). Prostheses used by individuals who are deaf to facilitate effective deaf-hearing social interactions include text-based technologies such as e-mail, the Short Message Service (SMS), National Relay Service (NRS), telephone typewriter (TTY), instant messaging (IM), and captioned television programs/DVDs (Bowe, 2002; Jacobs, 2004; Power, Power, & Horstmanhof, 2006). According to Bowe (2002) and Power et al. (2006), SMS, e-mail, and IM use are so widespread that there is a level playing field between individuals who are deaf and those who have typical hearing because of a common medium of instant communication. The active use of these text-based prostheses suggests that barriers to auditory content or communication can be bypassed by individuals who are deaf (Jacobs, 2004). All devices, however, necessitate literacy competence for effective use (Bowe, 2002; Power et al., 2006).

Studies have also indicated that watching captioned media can improve the linguistic skills of people who are deaf (e.g., Jelinek-Lewis & Jackson, 2001; Luckner & Muir, 2001; Toscano et al., 2002). Jacobs’ (2004) study with 16 participants who were deaf further suggested that captioned TV/DVD may assist the psychosocial skill development of individuals who are deaf. Learned Creativity was apparent among the participants who used captioned TV/DVD to increase their understanding of the content, and then modified their behavior to achieve better psychosocial outcomes in everyday contexts. For instance, one participant said that “watching subtitled programs has improved my verbal and listening skills. For example, I am more aware of ‘informal’ spoken language that includes colloquialisms, sayings, etc. Prior to captions I was never able to work out what it was that people were saying while in a romantic clinch, etc.” (pp. 93–94, Jacobs, 2004). An individual who is deaf can use literacy competence to create beneficial social outcomes with peers who have typical hearing.

Some authors believe that the levels of social knowledge in individuals who are deaf are linked with their language-based experiences (Calderon & Greenberg, 2000; Jelinek-Lewis & Jackson, 2001). The effects of these experiences tend to be cumulative. This viewpoint is reminiscent of Bernstein’s (1975) theory of restricted and elaborated linguistic codes. The restricted code involves a comparatively simplified speaking style that does not question or explain why or how things happen. For example, a parent may say “good job” instead of “I’m proud of you” (Calderon & Greenberg, 2000). According to Calderon and Greenberg, the child who is deaf can therefore miss out on
the potential meanings of “proud” as a new word. This could lead to the child having a restricted linguistic style that, in turn, can limit his or her psychosocial awareness.

The elaborated code refers to a linguistic style in which the meanings of words are specialized to suit the demands of abstract ideas, processes, or relationships (Bernstein, 1975). According to Bernstein, individuals with an elaborated linguistic code are more aware of their inner feelings and more skilled in complex decision-making processes than those with a restricted code. This theory links with Calderon and Greenberg’s (2000) view that greater exposure to spoken language can enhance the capacity for independent thinking and effective problem solving in individuals who are deaf. Bernstein’s theory of linguistic codes may partially explain why some individuals who are deaf appear to be better psychosocially adjusted than others with peers who have typical hearing.

Studies have further shown that participants who were deaf and have good speech-reading ability have more positive experiences with peers with typical hearing and more social knowledge than those who have poor speech-reading ability (Arnold, 1997; Harris & Moreno, 2006). Polat (2003) found that participants who were deaf and who had a high degree of speech intelligibility were better psychosocially adjusted than those with poor speech intelligibility. The two linguistic factors of speech-reading ability and speech intelligibility can also be linked with Bernstein’s (1975) theory of linguistic codes. Not only might these two linguistic factors assist in communication with peers who have typical hearing, they might also require mastery of Learned Creativity and an elaborate linguistic style. In contrast, neglecting to improve speech-reading or speech intelligibility may reinforce a restricted linguistic code and result in limited social exposure with peers who have typical hearing. This notion may explain why some CD individuals remain within the Deaf community and experience difficulties outside this realm (Muma & Teller, 2001; Scheetz, 2004).

Research has further shown that participants who were deaf learned more about their social environments when they had a “buddy” who had typical hearing (Bibby et al., 1996; Jacobs, 2004). The friend helped them learn about peer interactions and sharing gossip in social networks. In these studies, creative learning was apparent when a participant asked his or her buddy questions and then acted on this information in a social situation. It is therefore probable that sufficient speech intelligibility, speech reading ability, and psychosocial awareness in individuals who are deaf can maximize the potential of these deaf-hearing collaborations.

Social Ecologies

Social Ecologies involve an individual’s purposeful pursuit, sustenance, and maintenance of professional and social opportunities. Many participants
in Reiff et al.’s (1995) study emphasized the importance of emotional support and social connectedness that continued from childhood into adulthood. Participants reported that their parents persevered through external challenges, such as educators’ discriminatory behaviors and low expectations. Parents helped instill a value system consisting of proactive lifestyle practices that led to proactive professional and social outcomes for their children. Purposeful immersion in supportive social networks involved participants enlisting private support as well as intentional situational placements where advantages outweighed disability-related disadvantages. Participants were also not overly dependent on their support systems, yet they seemed to have achieved a balance by seeking help and guidance when required.

The role of the family’s value system in generating successful psychosocial outcomes has appeared in studies with students who were deaf and their families (e.g., Luckner & Muir, 2001; Toscano et al., 2002). Elements of these value systems included goal setting, constant motivation to achieve academically, acceptance of deafness, and not using deafness as an excuse for poor performance. Menchel’s (1995) findings further suggested that academically successful individuals who are deaf typically come from families of high socioeconomic status and with high academic qualifications.

Dependency on SL also appears to influence the characteristics of Social Ecologies for some individuals who are deaf. Saur, Coggiola, Long, and Simonson (1986) noted that signing individuals who are deaf have to deal with a time delay when requesting interpretation via an SL interpreter. Johnston, Leigh, and Foreman (2002) also raised concerns about the reliance on the teacher’s communication competence with SL and on SL interpreters’ ability to relay information to and from residential and partially mainstreamed students who are deaf. Teachers and interpreters who aren’t fluent in SL may impede access to spoken English and quality instructional content for individuals who are deaf (Antia, Reed, & Kreimeyer, 2005). The SL interpreter can interfere with the free-flowing discourse between individuals who are deaf and those who have typical hearing, and create a sense of dependency in which signing individuals who are deaf do not experience direct social interaction with peers with typical hearing (Brown & Foster, 1991). A reasonable supposition from these findings is that over-dependency on external support and sole reliance on SL may prevent individuals who are deaf from establishing Social Ecologies with peers who have typical hearing.

In addition, some studies have lamented the lack of deaf role models for young people who are deaf (e.g., Bain et al., 2004; Foster & Macleod, 2004). Twelve of 13 participants in Jacobs’ (2004) study who were deaf in childhood stated that they had no deaf role models during their developmental years. Individuals with typical hearing had acted as adequate substitutes. But a role model who is deaf could teach proactive strategies to circumvent psychosocial difficulties related to deafness (Bain et al., 2004) and provide career guidance (Bonds, 2003).
Studies have also found that individuals with typical hearing are more likely to support the participation of individuals who are deaf if they understand positive strategies for effective communication and have a positive attitude toward deafness (e.g., Brown & Foster, 1991; Stinson, Liu, et al., 1996). Positive strategies include sensitivity toward communication efforts, such as appropriately evoking attention, speaking in a manner that facilitates speech-reading, and sustaining eye-contact (Bain et al., 2004). Steinberg, Sullivan, and Montoya (1999) highlighted the importance of employers providing specific workplace accommodations for workers who are deaf. This may require a shift in values for individuals with typical hearing – a Reframing of stereotypes related to the capabilities of individuals who are deaf. Optimal deaf/hearing socialization outcomes do not depend solely on the adaptations made by individuals who are deaf; accommodations made by individuals with typical hearing are also beneficial (Bain et al., 2004; Bibby et al., 1996; Stinson, Liu, et al., 1996).

Peers who have typical hearing can additionally help to nullify or demystify negative stereotypes associated with deafness for people in the social networks of individuals who are deaf (e.g., acquaintances with little or no previous exposure to deafness) (Jacobs, 2004). Additional provided benefits can include help coping with stress, financial or employment assistance, physical accommodations, feelings of solidarity, information, advice, and emotional support (Calderon & Greenberg, 2000). These benefits can improve the coping abilities and overall mental health of individuals who are deaf.

Ethnicity and cultural issues are also important factors in individual perception of psychosocial attributes and tactics. For example, Scheetz (2004) suggests that both individuals who are deaf and individuals with typical hearing who are raised by parents whose second language is English may experience psychosocial difficulties in English-speaking communities. Some differences also exist among the three major world ethnic origins – Anglo-European, African, and Asian – regarding psychosocial issues and perceptions of deafness, which are elaborated below.

People of Anglo-European heritage who are deaf tend to value individualism, which includes a focus on values such as equality, self-direction, competition, freedom, self-reliance, and assertiveness (Scheetz, 2004). A child’s deafness is usually attributed to medical causes, and parental familiarity with deafness usually determines the measures taken to maximize the child’s psychosocial potential. In families of African heritage, religion, family relationships, acquisition of life skills, and education tend to be highly valued. According to Scheetz, a child’s deafness might be attributed to misfortune, bad luck, or, sometimes, superstitious causes. However, the psychosocial development of a child who is deaf is often considered a priority. Asian cultures tend to place an emphasis on status in social interaction. Hierarchical roles and rules are considered of utmost importance. In contrast to western individualism, Asian cultures tend to value obligation, cooperation, reciprocity, interdependence, and
subordination. Deafness in Asian societies can also carry considerable stigma (Scheetz, 2004).

Therefore, researchers must carefully consider Social Ecologies in socio-economic, ethnic, and cultural contexts. Given these demographic issues, however, it must be stated that Reiff et al.’s (1995) framework was created in the context of western thinking, which emphasizes individualism. Non-western cultures may not necessarily value these beliefs and personal characteristics (Scheetz, 2004).

**Psychosocial Potential Maximization**

Review of the literature strongly suggests that an individual’s aptitude for risk and resilience, rather than his or her hearing status (i.e., hearing or deaf) or identity affiliation (e.g., CD), is crucial for mastering each of the eight mentioned proactive psychosocial attributes and tactics. Another important revelation is that Reiff et al.’s (1995) framework (Figure 1) can be applied across academic domains that research disabilities (i.e., from LDs to deafness). The inclusion here of miscellaneous research unrelated to disabilities (e.g., Bloom, 1982) also suggests that the framework could be applied to research involving participants without disabilities.

Reiff et al.’s (1995) framework, however, was further scrutinized. The authors dictated that Control underpinned the seven other themes and was also the outcome of all the other themes operating collectively. This was ambiguous because the same label had two different meanings within the framework. It was clear that certain aspects of Control operated independently of the seven other themes. For example, Reiff et al. appeared to neglect the psychosocial influence that Rotter’s (1966) notion of external locus of control can have on an individual navigating his or her professional and social domains (e.g., an individual with typical hearing’s perceptions of the social competence of people who are deaf in Brown and Foster’s 1991 study).

It is also important to note that Reiff et al. (1995) used qualitative research, so the themes were not quantified. As mentioned at the beginning of this article, the literature review formed the basis of a doctorate dissertation. This exploratory mixed-methods study was with 49 adult participants over the age of 25 who had maximized their professional and social potential. The study was exploratory because a test instrument was created to score participants’ psychosocial competencies as conceptualized by Reiff et al.’s framework. To perform a rigorous quantitative and qualitative investigation, the theme of Control needs to be clarified for scoring purposes. In order to do this, Reiff et al.’s framework was modified so that the combined effect of the three thematic categories of Control, Internal Decisions, and External Manifestations equaled Potential Maximization (see Figure 2).

Figure 2 shows the additional theme of Potential Maximization as the overall outcome of Reiff et al.’s (1995) eight proactive psychosocial attributes and
tactics operating in a systematic and comprehensive manner. As such, Control was assigned to an independent thematic category. This modification contributed additional rigor to the intended quantitative and qualitative methodologies of this model of Psychosocial Potential Maximization in three ways. First, this model preserved Reiff et al.’s framework; second, it accommodated Rotter’s (1966) notions of both External and Internal Locus of Control; and third, it enables implementation of statistical procedures. Psychosocial Potential Maximization, therefore, defines an adopted and refined framework that conceptualizes how individuals maximize their professional and social potential using proactive psychosocial attributes and tactics.

The theme of Potential Maximization adds unique characteristics to Reiff et al.’s (1995) eight psychosocial themes. For instance, the review of the literature suggests that individuals who are deaf likely maximize their potential with a greater degree of personal accountability than that experienced by individuals with typical hearing. This notion is supported by Punch et al.’s (2005) study in which participants who were deaf employed proactive strategies to circumvent career barriers associated with deafness. As well
as mastering the psychosocial skills individuals with typical hearing use to gain social inclusion, individuals who are deaf likely use specific skills to circumvent psychosocial difficulties related to deafness. The direct experiential knowledge of deafness over time and space has likely honed a specialized form of Sternberg’s (1985) tactic knowledge that individuals with typical hearing have no use for because they are not deaf. Accommodations and adaptations made by individuals who have typical hearing are important extrinsic factors, but the effective use of this deafness-specific tactic knowledge by individuals who are deaf may significantly determine their professional and social destinies.

Age also appears to be a factor in self-actualization, or Psychosocial Potential Maximization. Maslow (1970) compared the findings of his study of 3,000 college students with his previous study (Maslow, 1950) with older participants and found that the characteristic of self-actualization were nearly absent in younger participants. Bar-On (1997) indirectly supports Maslow’s finding by suggesting that an individual’s emotional intelligence does not become fully developed until after the age of 25. In a disability context, Goldberg, Higgins, Raskind, and Herman’s (2003) study with 41 adults with LDs found that mastery of disability-related psychosocial challenges appears to improve with age. Research by Maslow (1970), Bar-On (1997), and Goldberg et al. (2003) indicates that individuals learn which psychosocial tactics work and which do not through active risk-taking and resilience. An individual therefore accumulates tactic knowledge over time and space from these experiences (Sternberg, 1985, 1988).

The link between Psychosocial Potential Maximization and age provides a crucial new context for research into deafness. As noted earlier, many deafness-related professionals seem ill-equipped to foster their students’ or clients’ psychosocial potential (Bowe, 2003; Calderon & Greenberg, 2003). This, and the observed low levels of psychosocial competence in adults who are deaf (Bowe, 2003; Harvey, 1998), may indicate insufficient evidence-based research informing best educational or clinical practices. These two notions are particularly worrying considering that research significantly guides, informs, and assesses educational and clinical practices. A paradigm shift toward the R&R model in the academic domain of deafness may offer far-reaching positive outcomes. Purposefully investigating the psychosocial capabilities of adults who are deaf will likely provide richer and more detailed information on how psychosocial potential can be maximized. It follows that this research can, in turn, contribute to best educational and clinical practices. First, however, the Psychosocial Potential Maximization framework outlined in this article needs to be subjected to testing. This can be achieved by applying the framework to methodological principles (e.g., designing survey items) and testing them with suitable participant groups. The findings may thereafter provide greater insight into the psychological well-being and social participation of individuals who are deaf.
Conclusion

The purpose of this article was to define a comprehensive and systematic framework of proactive psychosocial attributes and tactics that individuals who are deaf can use to maximize their professional and social potential. Reiff et al.’s (1995) framework provided a theoretical construct that was modified for the purposes of conducting rigorous quantitative and qualitative research. These methodological issues are discussed further in a forthcoming manuscript that will present empirical findings and will be authored by Dr. Paul Jacobs, Associate Professor Margaret Brown, and Dr. Louise Paatsch. These empirical findings were sourced from survey data with American, Australian, and British participants who were deaf (n = 30) and who had typical hearing (n = 19). Professional and social success was apparent in the participants use of numerous proactive psychosocial attributes and tactics with peers who were both hearing and deaf (including participants who were deaf who self-identified as CD).

The review of the literature, however, suggested that it was necessary to conduct an exploratory study that did not use existing test instrumentation. Hypotheses were therefore not used. Instead, the empirical study to be outlined in the forthcoming article has two major aims. The first aim will be to employ the Psychosocial Potential Maximization framework to identify the proactive psychosocial attributes and tactics used by adult participants who are deaf to maximize their professional and social potential. The second aim will be to compare these attributes and tactics in adult participants who are deaf with participants who have typical hearing.

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References


A Pilot Investigation Regarding Speech-Recognition Performance in Noise for Adults with Hearing Loss in the FM+HA Listening Condition

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While the concurrent use of the hearing aid (HA) microphone with frequency modulation (FM) technology can decrease speech-recognition performance, the FM+HA condition is still an important setting for users of both HA and FM technology. The primary goal of this investigation was to evaluate the effect of attenuating HA gain in the FM+HA listening condition on the signal-to-noise ratio for 50% sentence recognition in two situations: (1) when speech was presented to the FM transmitter microphone and (2) when speech was presented to the HA microphone. A second goal was to determine whether measures based on the Articulation Index (AI) could be used to predict
speech-recognition performance. The best speech-recognition performance for the first situation occurred when the HA gain was attenuated by 20 decibels (dB), while the best performance for the second situation occurred when there was 0 dB of attenuation. The AI measures were directly related to speech-recognition performance.

Introduction

One well-recognized method for improving speech recognition for listeners with hearing loss is the use of frequency modulation (FM) technology. An FM system has two parts: a transmitter and a receiver. The speaker’s voice is picked up via a wireless microphone on an FM transmitter located near his or her mouth where the effects of reverberation, distance, and noise are minimal. The FM system then converts the acoustic signal to an electrical waveform and transmits the signal via FM radio waves from the transmitter to the receiver. The transmitter and the receiver are tuned to the same radio frequency. At the receiver, the electrical signal is amplified, converted back to an acoustical waveform, and conveyed to the listener. FM technology may be used with hearing aids (HAs). When these two systems are combined, users typically have access to three settings: (1) FM only, (2) HA only, and (3) FM+HA.

Past investigations have demonstrated that the use of FM technology can improve the signal-to-noise ratio (SNR) for 50% sentence recognition for adults with hearing loss by as much as 20 dB over unaided listening conditions and 12 dB to 18 dB over HA-alone listening conditions (Lewis, Crandell, Valente, & Horn, 2004). However, other research has shown that the simultaneous use of an HA microphone with the FM system can reduce speech-recognition performance in comparison with the FM-only listening condition (Hawkins, 1984; Lewis, 2002). While the FM+HA listening condition may reduce speech-recognition performance, it is still an essential listening condition for people with hearing loss as it allows them to address three primary listening goals simultaneously: (1) listen to the individual speaking into the FM transmitter microphone; (2) hear individuals in their immediate environment; and (3) monitor their own voices (Lewis & Eiten, 2003). An example of an FM+HA listening condition is an adult attending a religious service or lecture, where he wants to hear the primary speaker but also wants to hear his friends who are sitting nearby.

Recent advancements in both HA and FM technology have created a number of features that audiologists can manipulate when fitting these devices to their patients. Despite the critical nature of the FM+HA listening condition, only a handful of studies have examined the effect of different HA and FM fitting parameters on speech recognition in this situation (e.g., Boothroyd & Iglehart, 1998; Fabry, 1994; Pittman, Lewis, Hoover, & Stelmachowicz, 1999; Rowson & Bamford, 1995). Two of these studies addressed one particular fitting issue: the optimum FM advantage (i.e., the difference in output levels between the FM transmitter microphone and the HA microphone). The first
study, conducted by Rowson and Bamford (1995), provided theoretical estimates of the improvement in the SNR that can be obtained in the FM+HA condition compared to the HA alone condition. These calculations were based on a situation in which the person using the hearing instrument would be listening to the person speaking into the FM transmitter microphone; the calculations were made as a function of FM gain versus HA gain. The calculations revealed that when the FM gain is reduced relative to the HA microphone gain, the SNR advantage decreases. Minimal improvements in SNR occurred when the FM gain was reduced by 20 dB in comparison to the HA gain. The second study, by Boothroyd and Iglehart (1998), evaluated the effect of reducing FM transmitter microphone sensitivity relative to HA microphone sensitivity on speech recognition in both quiet and noise for subjects with severe to profound hearing losses. The study revealed that speech recognition was poorer in the listening condition where the output of the signal from the FM and the output of the signal from the HA microphone were nearly identical (equal output) compared to the listening condition where the output of the signal from the FM transmitter microphone was greater than the output of the signal from the HA microphone by 15 dB (equal gain). In fact, the first condition almost removed the benefit offered by the FM system for these subjects. Taken together, the two studies suggest that the FM gain should be set greater than the HA gain to maximize speech recognition in the FM+HA condition. It should be noted, though, that both studies only examined performance for the stimuli coming from the FM transmitter microphone. No information was provided on the effect of changing the FM gain or the HA gain in the FM+HA condition on how well the subject heard other speech stimuli in the immediate environment or his own voice.

Although the research described above does provide some recommendations regarding setting the FM gain and the HA gain to maximize audibility in the FM+HA condition, these studies had several limitations. For instance, only one study evaluated speech recognition in noise among people with hearing loss while stimuli were presented to the FM transmitter microphone (Boothroyd & Iglehart, 1998). Additionally, Boothroyd and Iglehart (1998) only tested two different FM and HA settings. Today’s FM systems allow a number of different settings.

With these factors in mind, the primary purpose of our investigation was to determine the effect of HA gain attenuation on speech-recognition performance for adults with hearing loss in the FM+HA listening condition in two different listening situations: (1) when speech is presented to the FM transmitter (to represent the primary speaker) and (2) when speech is presented to the HA (to represent other speakers in the environment not using the FM transmitter). A second goal of the project was to determine whether measures based on the Articulation Index (AI) (e.g., Steeneken & Houtgast, 1980) could be used to predict speech-recognition performance for each of these listening conditions. These AI measures, which are a simpler version of the Speech Intelligibility
Index (SII, ANSI S3.5 – 1997, 1997), are based on weighted combinations of the relative levels of speech and noise in various frequency regions. The use of AI (rather than SII) calculations provide the most straightforward application of these ideas to a new situation and follows the work of Boothroyd (2004), who found the benefits of FM assistance to be well predicted by AI-based measures. Examining the degree to which these measures predict speech-recognition performance allows us to make a distinction between the relative contributions of acoustics and factors specific to an individual listener.

Methods

Subjects

All study participants met the following inclusion and exclusion criteria: (1) slight to severe high-frequency or flat hearing loss as indicated by pure-tone air-conduction test results (250 Hz to 8,000 Hz, including 3,000 Hz and 6,000 Hz); (2) symmetrical hearing loss that does not differ by more than 15 dB at more than one audiometric test frequency; (3) a word recognition score (WRS) of 50% or better in quiet as assessed by recorded versions of Central Institute for the Deaf W-22 word lists presented at 40 dB above the speech reception threshold; (4) self-reported motivation to try amplification; (5) self-reported native English speaker; (6) intact mental status as measured by the Short-Portable Mental Status Questionnaire (SPMSQ; Erkinjuntti, Sulkava, Wikström, & Autio, 1987); and (7) willingness and ability to give written informed consent to participate in this investigation by signing the consent form.

Ten adult subjects, 9 male and 1 female, were recruited from previous HA studies conducted at the National Center for Rehabilitative Auditory Research (NCRAR), Portland Veterans Affairs (VA) Medical Center. These subjects ranged in age from 60 to 81 years, with a mean age of 72 years (±9 years). Mean air-conduction thresholds (±1 standard deviation [SD]) are presented in Figure 1. These mean thresholds are consistent with a slight hearing loss in the lower test frequencies, sloping to a severe hearing loss in the higher test frequencies. Audiologic findings for these subjects suggested sensorineural hearing loss. Word recognition scores were 86.4% (±7.8%) and 84.2% (±8.4%) for the right and left ears, respectively. Independent sample t-tests showed no significant difference (p > 0.05) between the right and left ears in terms of the three-frequency pure-tone average (PTA) or the WRS in quiet. All subjects had previous experience with amplification.

Amplification Systems

All study participants were fitted with a binaural set of Phonak Claro 311 dAZ behind-the-ear hearing instruments. All earmolds had select-a-vent
venting and #13 tubing. The HAs were fit as recommended in the NAL-NL1 prescriptive fitting formula (Byrne, Dillon, Ching, Katsch, & Keidser, 2001) provided on the Phonak Fitting Guideline Version 8.3 software. To ensure audibility, these fitting parameters were compared with an NAL-RP target (Byrne, Parkinson, & Newall, 1991) on the Frye Fonix 6500 probe-microphone system using a composite test signal presented at 65 dB SPL. Mean NAL-RP fitting targets and real-ear insertion gain (REIG) responses (±1 SD) are shown in Table 1. The results in this table illustrate that the hearing aid fittings provided a close approximation of the NAL-RP target through 6,000 Hz.

In addition to the HAs, all subjects were fitted with Phonak Microlink ML8 FM receivers bilaterally. These FM receivers can be used in either the FM-only mode or the FM+HA mode. Despite its name, the FM-only mode on these devices allows for simultaneous inputs from both the FM system and the HA. In this mode, the HA gain is attenuated by 20 dB. This level of HA attenuation cannot be changed in this mode. On the other hand, in the FM+HA mode, a range of HA gain attenuation levels from 0 to 40 dB can be used. The HA gain attenuation levels in this mode can only be adjusted by using the hearing aid fitting software. FM gain levels could not be adjusted on these devices.
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<td>25.3 (2.6)</td>
<td>26.2 (3.5)</td>
<td>26.4 (4.0)</td>
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<tr>
<td>REIG</td>
<td>2.8 (2.8)</td>
<td>5.7 (3.7)</td>
<td>12.4 (5.7)</td>
<td>20.4 (5.1)</td>
<td>18.9 (4.8)</td>
<td>21.7 (2.8)</td>
<td>22.3 (4.3)</td>
<td>19.5 (6.2)</td>
<td>22.4 (4.7)</td>
<td>4.7 (5.1)</td>
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**Table 1.** Mean (±1 SD) NAL-RP (Bryne, Parkison, & Newall, 1991) targets and real-ear insertion gain (REIG) responses.
An HA gain level of 0 dB is roughly approximate to equating the output of the FM and HA signals (i.e., equal output). In the FM+HA mode, the HA is in the omnidirectional microphone mode. To obtain a rough approximation of the audibility of the signals through both the FM system and the HA at each of the experimental HA attenuation levels (0, 10, 20, 30, and 40 dB), electroacoustic analyses were conducted using a Frye Fonix 6500 HA analyzer and the company’s recommended test procedures for evaluating FM technology (Frye Electronics, Inc., 2003). Each device was evaluated using a 2cc coupler and a composite test signal to obtain the electroacoustic FM+HA response with a 65 dB sound pressure level (SPL) input to the HA microphone (EEF65\(^2\)), and the electroacoustic FM+HA response with an 80 dB SPL input to the FM microphone (EFE80\(^3\)). Mean 2cc coupler gain responses across frequency obtained for the right and left amplification devices during electroacoustic analyses are shown in Table 2. A review of this table shows that, as the HA attenuation was increased, the HA provided less coupler gain to the system (see EEF65 responses). Hearing aid microphone attenuation was programmed to change in 10 dB increments. The table shows that this attenuation is fairly accurate and that the amount of coupler gain derived from the FM transmitter microphone/receiver was relatively unchanged as HA attenuation levels were adjusted (see EFE80 responses). This is logical, because the FM microphone setting was not being adjusted.

After the HA and FM systems were fitted, study subjects were given the hearing instruments to use in their everyday listening environments so they could get used to the devices. During this time, they were given access to various programs, including omnidirectional and directional microphones, FM-only mode, and FM+HA mode. The FM+HA mode was left at the default HA attenuation level setting of 0 dB. The study subjects received detailed counseling on the use of all these programs before they left the clinic. Proper use and care of the devices were reviewed. Follow-up contact with the study participants was provided as needed. All subjects reported using both the HAs and the FM

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\(^1\)This pilot study was initially proposed to Phonak for funding in 2003; the study subjects described in this paper were evaluated in 2005. At that time, the American Speech-Language-Hearing Association (ASHA) 2000 Guidelines for Fitting and Monitoring FM Systems (ASHA, 2000) contained the recommended methods for conducting electroacoustic analyses with FM technology. The electroacoustic analyses presented in this manuscript are consistent with those guidelines. After this work was conducted, material appeared suggesting that the ASHA recommended procedures may have underestimated the true amount of gain reported in this manuscript because of the compression characteristics of the FM transmitter microphone and the nonlinear hearing instruments (see Lewis, 2006; Lewis & Eiten, 2004; Platz, 2004; 2006; Schafer, Thibodeau, Whalen, & Overson, 2007).

\(^2\)EEF65 = represents the typical electroacoustic response of the hearing aid by using a 65 dB SPL input.

\(^3\)EFE80 = represents the typical electroacoustic response of the FM transmitter microphone/receiver by using an 80 dB SPL input.
system successfully for at least 30 days before having their speech-recognition performance assessed. To ensure that the devices were functioning properly, a biologic listening check and an electroacoustic analysis were performed before the assessment of speech-recognition performance. After speech-recognition performance in noise was tested (i.e., the study was completed), the subjects returned the amplification systems to NCRAR. Subjects who were interested in purchasing the devices were given a list of audiology clinics in the local area that reported dispensing the hearing devices used in this investigation.

**Assessment of Speech-Recognition Performance**

**Speech Stimuli**

The Hearing in Noise Test (HINT) sentences (Nilsson, Soli, & Sullivan, 1994) were used to assess speech recognition. The HINT consists of 25 lists, each containing 10 sentences. Each HINT sentence is six to seven syllables in length (Nilsson, McCaw, & Soli, 1996). All sentence lists are equal in length, phonemic content, and difficulty level, and research has demonstrated that these sentences have high test-retest reliability (Nilsson et al., 1994). The sentences were stored as sound files on a computer (Intel with a Pentium 2 processor). They were presented and attenuated using custom-produced software on a second computer (Hewlett Packard with a Pentium 4 processor) and a programmable

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<th>500 Hz</th>
<th>1,000 Hz</th>
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<td>40 dB</td>
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<td>−10.4</td>
<td>1.1</td>
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<td>19.1</td>
<td>−5.6</td>
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attenuator (Tucker-Davis Technologies, PA4). The output of the programmable attenuator was amplified (Crown, Model CP, 660) and delivered to a loudspeaker (JBL Monitor 28). This loudspeaker was located either at 0° azimuth and 1.2 meters from the study participant or at 90° azimuth and 1.2 meters from the participant, depending on the test condition. These distances were chosen as a compromise between the results of a previous investigation that examined various combinations of FM systems and HA that allowed the listener to hear the main talker via the FM transmitter microphone as well as others in the listening environment via the HA (Pittman et al., 1999) and space limitations within the audiometric test booth.

Noise Competition

Speech spectrum-shaped noise was the competing stimulus. This noise was filtered to match the long-term average speech spectrum of the HINT sentences (Nilsson et al., 1996). Speech noise is a typical “disturbing sound” of everyday listening situations (Crandell, 1991; Plomp, 1986). Additionally, speech spectrum-shaped noise has been shown to have a negative effect on speech recognition for both young and old individuals with hearing loss and those without hearing loss (Nilsson et al., 1994; Prosser, Turini, & Arslan, 1990). This uncorrelated noise competition was created by sampling the HINT noise at different times, then recording this material on four separate audio tracks (one for each loudspeaker) stored on two separate compact discs. It was presented and attenuated using custom-produced software on a second computer (Hewlett Packard with a Pentium 4 processor) and a programmable attenuator (Tucker-Davis Technologies, PA4). The output of the attenuator was amplified (Crown, Model CP, 660) and delivered to four loudspeakers (JBL Monitor 28) located at 45°, 135°, 225°, and 315° azimuths and 1.7 meters away from the study participant.

Procedures

Speech recognition in noise was assessed in a double-walled Acoustic Systems sound-treated chamber (1.96 meters [height] x 2.6 meters [width] x 2.4 meters [length]) using the loudspeaker configurations shown in Figures 2 and 3. Testing was conducted in two conditions: (1) when speech was presented to the FM transmitter (to represent the primary speaker) and (2) when speech was presented to the HA (to represent other speakers in the environment not using the FM transmitter). The FM transmitter microphone was 7.5 centimeters in front of the high-frequency element of the loudspeaker located at 0° azimuth. Testing was conducted with the FM transmitter in the zoom setting (i.e., one directional microphone), as a previous investigation had suggested that this setting be used to obtain the maximal SNR for 50% sentence recognition when using a two-element loudspeaker (Lewis, Crandell, & Kreisman, 2004). To ensure consistency
of the speech and noise signals, regular calibrations were made from the location of the subject’s head using a sound-level meter. Specifically, a laboratory microphone (Brüel and Kjaer, Type 4192) was suspended from the ceiling of the test chamber to occupy the center of the space where the listener’s head was positioned during testing. Power for the preamplifier (Brüel and Kjaer, Type 2669) and the bias voltage for the condenser microphone were provided by a power supply (Brüel and Kjaer, Type 2807). An integrating sound-level meter (Brüel and Kjaer, Type 2238) was used to monitor the microphone output.

An adaptive procedure using the HINT materials was used to obtain a reception threshold for sentences for the unaided listening condition, as well as for each of the five experimental HA attenuation levels at each of two loudspeaker

Figure 2. Diagram of the loudspeaker configuration when speech was presented from the loudspeaker located at 0° azimuth (shaded loudspeakers were active).
locations: $0^\circ$ azimuth (speech presented primarily to the FM transmitter microphone) and $90^\circ$ azimuth (speech presented primarily to the HA microphone). Ceiling and floor effects are not a limitation in this type of procedure as they are in percentage-correct recognition procedures (Nilsson et al., 1994). The noise level was set at $65 \text{ dB LA}_{eq,20}$ and the intensity level of the sentences was varied in the increments recommended by the HINT protocol (Nilsson et al., 1996). A noise level of $65 \text{ dB LA}_{eq,20}$ was selected because it is typical of noise levels present in classrooms and many other listening environments (Blair, 1977; Jamieson, Kranjc, Yu, & Hodgetts, 2004; Ross & Giolas, 1971; Sanders, 1965; Wagener, Hanson, & Ludvigsen, 2008). For each listening condition, the subject was presented with two HINT sentence lists consisting of 20 sentences.

**Figure 3.** Diagram of the loudspeaker configuration when speech was presented from the loudspeaker located at $90^\circ$ azimuth (shaded loudspeakers were active).
By adaptively varying the level of speech at the location of the listener’s head so that an SNR of 0 dB would correspond to both speech and noise having a level of 65 dB $\text{LA}_{eq \ 20}$, the SNR for 50% sentence recognition was calculated for six different listening conditions for each of the two loudspeaker locations. These listening conditions were unaided; 0 dB HA gain attenuation; 10 dB HA gain attenuation; 20 dB HA gain attenuation; 30 dB HA gain attenuation; and 40 dB HA gain attenuation. These setting levels were chosen as a compromise between time constraints and HINT sentence limitations, while still allowing the range of attenuation settings available via the amplification systems to be evaluated. All aided listening conditions and HINT sentence lists were randomized to prevent potential order effects. No practice lists were given. The FM microphone was active during the testing of both loudspeaker locations. On the basis of measurements described in more detail below, when the level at the listener’s location was 65 dB $\text{LA}_{eq \ 20}$ (which corresponds to the 0 dB SNR), the level of speech at the location of the FM transmitter microphone was determined to be 78.9 dB $\text{LA}_{eq \ 20}$ for the 0° azimuth location and 62.1 dB $\text{LA}_{eq \ 20}$ for the 90° azimuth location.

**Calculation of the Articulation Index**

To characterize the changes in SNR at the output of the amplification systems across the various listening conditions, we estimated the intelligibility of the signal based on the effective SNR at the four frequencies at which the gain of the hearing devices had been measured (see Table 2). This estimate was based on the logic of the Articulation Index (AI) of French & Steinberg (1947), but, for ease of computation, the calculations were based on the algorithm suggested by Houtgast & Steeneken (1985). This algorithm includes not only SNR but also information about modulation transmission, which makes it useful for estimating intelligibility in reverberant environments. As modulation values were not available and SNR was the main concern of this study, the calculations were based on a simplified version of the Houtgast & Steeneken (1985) algorithm, using as inputs root-mean square (RMS) measurements of sinusoidally amplitude modulated (SAM) noise and broadband noise made at the locations of the FM transmitter microphone and the location of the listener’s head. To determine the SNR at the ear of the listener when the nominal levels were equated, the measurements were scaled according to the gain of the hearing devices measured in the 2cc coupler for each subject (average values are shown in Table 2). This scaling enabled us to make AI calculations for each listener in each condition; however, it limited the range of frequencies that could be included. Rather than the seven octave frequencies between 125 Hz and 8,000 Hz specified by French & Steinberg (1947), our calculations took into account only the four octave frequencies between 500 and 4,000 Hz for which meaningful gain measurements were available. In addition, because of technical issues, several of the 2cc coupler measurements were not usable.
for two of the listeners, so one was excluded from the analysis entirely and the other contributed AI values at only two of the four frequencies.

As the first step in calculating the AI for a given listener in a given condition, we determined the SNR in the four octave bands measured (500 Hz, 1,000 Hz, 2,000 Hz, and 4,000 Hz) and limited those values to a 30 dB range around 0 dB (i.e., −15 dB to +15 dB). This range limit was specified by French & Steinberg (1947) on the basis of data suggesting that although SNR values outside this range occur, they do not meaningfully affect the intelligibility of speech. Limiting the range of possible SNR values also controls the range of AI values.

In the second step, we weighted each of the four SNR values by the appropriate factor (0.11, 0.12, 0.19, and 0.17) specified by French & Steinberg (1947) on the basis of their analyses of a number of studies of speech intelligibility with narrow bands of masking noise. We determined the final AI value by summing these four weighted SNR values, adding 15 to the result, and dividing the total by 30. In the original calculation, this would result in a value that falls between 0 (which would occur if each SNR were −15) and 1 (if each SNR were +15). The original calculation, however, assumed that seven SNR values would be available (between 125 Hz and 8,000 Hz). Because we had reduced the range to the number of frequencies for which gain values had been obtained, the minimum AI value became 0.205 and the maximum became 0.795. As the goal was to quantify the change in information with change in listening condition, however, the precise values are of less importance than the relative values. Indeed, as French & Steinberg (1947) point out, the relationship between speech understood and a given AI value is always approximate, owing to the dependence on factors such as type of material and ability of the listener.

### Results

**Speech Recognition-Performance in Noise**

Results of a two-way analysis of variance (ANOVA) with repeated measures using the within-subjects factors of listening condition and loudspeaker location revealed a significant main effect of listening condition ($F_{5,45} = 12.01$, $p < 0.001$) and loudspeaker location ($F_{1,9} = 177.2$, $p < 0.001$), and a significant interaction between the two main effects ($F_{5,45} = 67.3$, $p < 0.001$). Multiple comparison procedures (at an alpha level of $p = 0.05$), using a Bonferroni correction, revealed a significant difference in the SNR for 50% sentence recognition between the unaided listening conditions and all the aided listening conditions except the 40 dB HA gain attenuation level. We found no other significant differences among listening conditions.

The mean SNR for 50% sentence recognition (±1 SD) for the listening conditions when speech was presented from the loudspeaker located at 0° azimuth (speech presented primarily to the FM transmitter microphone) and from the
loudspeaker located at 90° azimuth (speech presented primarily to the HA microphone) are shown in Figures 4 and 5, respectively. Because the primary purpose of this pilot investigation was to evaluate the effect of the five HA gain attenuation levels on the SNR for 50% sentence recognition at each loudspeaker location, we conducted a repeated-measures ANOVA across the six conditions for each loudspeaker location. The ANOVA for the loudspeaker located at 0° azimuth revealed a significant difference between the listening conditions ($F_{5,45} = 54.9, p \leq 0.001$). Multiple comparison procedures, using a Bonferroni correction, revealed that the SNR for 50% sentence recognition for the unaided condition was significantly different from that of all the aided listening conditions, and the SNR for 50% sentence recognition obtained at 0 dB of HA attenuation was significantly different from that of all the other listening conditions except the SNR for 50% sentence recognition obtained at the 10 dB HA attenuation level. We found no other significant differences among listening conditions. The ANOVA for the loudspeaker located at 90° azimuth revealed a significant difference between the listening conditions ($F_{5,45} = 4.1, p = 0.004$). Multiple comparison procedures, using a Bonferroni correction, revealed that the SNR for 50% sentence recognition obtained at the 0 dB HA attenuation level was significantly different from the SNR for 50% sentence recognition obtained at the 40 dB HA attenuation level. None of the other listening conditions were significantly different from one another.

**Figure 4.** Mean SNR for 50% sentence recognition (±1 SD) for the listening conditions where speech was presented from the loudspeaker located at 0° azimuth. Striped bars signify the listening conditions that were significantly different from the unaided listening condition. Lighter gray bars signify listening conditions that were significantly different from the SNR for 50% sentence recognition from the 0 dB HA attenuation level.
Figure 5. Mean SNR for 50% sentence recognition (±1 SD) for the listening conditions where speech was presented from the loudspeaker located at 90° azimuth. The horizontal bar indicates that only the SNR for 50% sentence recognition obtained at the 0 dB HA attenuation level was significantly different ($p < 0.05$) from the SNR for 50% sentence recognition obtained at the 40 dB HA attenuation level. No other conditions were significantly different from one another.

Articulation Index (AI)

We made the AI calculations described above on the basis of the effective SNR values at the output of the hearing devices for the various conditions when the levels of speech and noise were equal at the HA location. Initial measurements of the RMS levels of SAM noise (to represent speech) and broadband noise at the locations of the HA and FM microphones revealed that the level at the HA location was between 64.9 dB LA$_{eq}$ and 65 dB LA$_{eq}$ for both signals, regardless of the location of the SAM noise. For the FM transmitter microphone, however, the level of the SAM noise varied substantially with location, as we expected: 78.9 dB LA$_{eq}$ for the 0° azimuth location versus 62.1 dB LA$_{eq}$ for the 90° azimuth location. The broadband noise level was 64.1 dB LA$_{eq}$ at the location of the FM transmitter microphone. For the HA and FM conditions, we added the gain values in Table 2 to the measured levels, then transformed them into amplitude values. We then summed these amplitude values for the HA and FM transmitter microphones and converted the total amplitude back into decibel levels. This resulted in estimates of the speech and noise levels at the output of the hearing devices for octave bands between 500 Hz and 4,000 Hz. Average values (within each band) for speech varied between 60.0 dB SPL and 101.6 dB SPL, while average noise values varied between 61.3 dB SPL and 95.7 dB SPL. The average SNR values varied between −1.7 dB and 16.8 dB. For the purposes of the AI calculation, all SNR values above 15 were treated as 15 (French & Steinberg, 1947). The resulting AI values for the 9 individual
listeners in the aided conditions ranged between 0.466 and 0.557 for speech at 90° azimuth and 0.571 and 0.769 for speech at 0° azimuth. Unaided values were the same for all listeners and were calculated based on the levels measured at the HA location. When the speech was at the 90° azimuth location, the unaided AI was 0.500; when the speech was at the 0° azimuth location, the unaided AI was 0.498. A value of 0.5 corresponds to an SNR of 0 dB, so this was the expected value for the unaided conditions as all calculations were made on the basis of equal speech and noise levels at the location of the HA.

To examine the relationship between AI and the SNR for 50% sentence recognition (plotted in the top panel of Figure 6), we calculated the correlation between these values for the 0° azimuth location and the 90° azimuth location conditions. For the 0° azimuth location, where the range of values was greatest (filled circles in Figure 6), the correlation was −0.788, which is significant at

![Figure 6](image-url)  
**Figure 6.** The relationship between the SNR for 50% sentence recognition and AI (top panel), age (bottom left panel), PTA averaged across left and right ears (bottom center panel), and WRS averaged across ears (bottom right panel). The data for the listening conditions when speech was presented from the loudspeaker located at 0° azimuth are indicated by the filled symbols (Front) and the data for the listening conditions when speech was presented from the loudspeaker located at 90° azimuth are indicated by the unfilled symbols (Side). The solid lines indicate least-squares linear fits to the data from both listening conditions. Significant correlations were obtained for the AI relationships ($p < 0.01$) but not for the other relationships.
the $p < 0.01$ level. For the 90° azimuth location, where the range of values was fairly small (unfilled squares in Figure 6), the correlation was −0.373, which also is significant at the $p < 0.01$ level. The bottom panels in Figure 6 show the relationships between age and SNR for 50% sentence recognition, average PTA (across ears) and SNR for 50% sentence recognition, and average WRS (across ears) and SNR for 50% sentence recognition. None of the relationships approached significance at the $p < 0.05$ level.

**Discussion**

In this investigation, all the aided conditions for which speech was presented primarily to the FM transmitter (i.e., from the loudspeaker located at 0° azimuth) were significantly better than the unaided listening condition. On average, these conditions resulted in an SNR for 50% sentence recognition of −9.4 dB to −14.1 dB or an improvement in SNR of 8.6 dB to 13.3 dB over the unaided listening condition. This finding seems reasonable given Lewis’s (2002) results. In that investigation, Lewis evaluated the SNR for 50% sentence recognition for 22 adults with slight to severe sensorineural hearing loss in a variety of listening conditions, including the unaided listening condition and the FM+HA listening condition (using the default setting of 0 dB HA attenuation level). The HINT sentences presented from 0° azimuth served as the speech stimuli, and correlated speech spectrum-shaped noise presented at 65 dB SPL from four loudspeakers located at 45°, 135°, 225°, and 315° azimuths served as the noise competition. All loudspeakers were located 1 meter away from the study participant. Study results revealed a mean SNR for 50% sentence recognition for the FM+HA listening condition of −15.7 dB – an improvement in SNR of 20.6 dB over the unaided listening condition. The slightly better results reported in the Lewis (2002) study are likely due to the use of correlated noise rather than the uncorrelated noise used in this investigation, as well as the fact that the loudspeakers were located closer to the subject (1 meter) in the Lewis study.

The mean SNR for 50% sentence recognition for the conditions in which the sentences were presented, primarily to the HA (i.e., from the loudspeaker located at 90° azimuth), ranged from 1.5 dB to −2.2 dB. Other investigations have reported similar SNR values when speech was presented from directly in front of the listener (Amlani, 2001; Bentler, Egge, Tubbs, Dittberner, & Flamme, 2004; Lewis, Crandell, Valente, et al., 2004; Ricketts & Dhar, 1999; Valente, Fabry, & Potts, 1995). For example, Lewis, Crandell, Valente, and Horn (2004) reported a mean SNR for 50% sentence recognition of 0.07 dB for binaural HAs used with omnidirectional microphones when speech was presented from 0° azimuth. Similar side comparisons are not available.

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4A review article by Lewis, Crandell, and Valente (2004) covers some of the details related to this investigation.
Effect of Loudspeaker Location

The statistical analyses revealed a significant main effect for loudspeaker location. In other words, the conditions in which speech was presented primarily to the FM transmitter resulted in an improvement in SNR for 50% sentence recognition of 10.6 dB to 15.6 dB over the conditions in which speech was presented primarily to the HA. Other investigations have reported a similar improvement in speech recognition in noise with the use of FM+HA arrangements over the use of HAs alone (Boothroyd & Iglehart, 1998; Fabry, 1994; Lewis, 2002). In fact, Lewis (2002) reported an improvement in SNR for 50% sentence recognition of 15.5 dB in the FM+HA listening condition over the listening condition in which binaural HAs were used in the omnidirectional microphone mode. Additionally, Pittman et al. (1999) reported a significant improvement in speech-recognition performance for children with moderate-to-severe hearing losses when speech was presented directly to an FM transmitter located at 0° azimuth (73.67%) versus speech presented to the HA from a loudspeaker located behind and to the side of the subject (50.91%).

Effect of HA Attenuation Setting

A primary supposition in this study was that the five HA attenuation levels would have a significant effect on the SNR for 50% sentence recognition. We expected to see improvements in SNR for 50% sentence recognition as the HA attenuation was increased in the conditions where speech was presented in front of the FM transmitter microphone (or from the loudspeaker located at 0° azimuth), owing to better audibility. We also expected that the SNR for 50% sentence recognition would decrease as the HA attenuation increased for the conditions in which speech was presented to the HA (or from the loudspeaker located at 90° azimuth), owing to decreased audibility. For the loudspeaker located at 0° azimuth, we saw a trend toward an improvement in SNR for 50% sentence recognition as the HA attenuation was increased; however, this trend leveled off after 20 dB. In fact, Figure 4 shows that speech recognition was best at the three highest HA attenuations values (20 dB, 30 dB, and 40 dB) for this loudspeaker and the statistical analysis reveals that there was no significant difference in SNR for 50% sentence recognition among these three settings. Similarly, the results obtained from the loudspeaker located at 90° azimuth showed a trend toward poorer SNRs for 50% sentence recognition as the HA attenuation was increased. The results for this loudspeaker location revealed that the poorest SNR for 50% sentence recognition occurred at the greatest HA attenuation value (40 dB); however, there were no significant differences in speech recognition among the other listening conditions. These findings are not surprising given the results of the electroacoustic analyses conducted on the amplification systems and the AI calculations reported in this investigation. Table 2 shows that the HA is providing less gain to the amplification
system as HA attenuation is increased and that the HA is providing little to no gain at attenuation levels greater than 20 dB. Our results also correspond with the findings of Boothroyd and Iglehart (1998), who reported that a +15 dB FM/HA ratio (equal gain) resulted in improved speech recognition in noise over a 0 dB FM/HA ratio (equal output).

Relationship with AI

The AI analysis showed clearly that the changes in performance with the different HA attenuation levels are directly related to changes in SNR, and thus to the audibility of the speech information. Perhaps surprisingly, there was no indication that additional variance was accounted for by age, PTA, or WRS of the participants. Boothroyd (2004) also found that age did not predict speech-recognition performance with the use of FM technology. He did find, however, that phoneme recognition with the use of FM technology was accurately predicted by a calculation of the AI that accounted for pure-tone threshold sensitivity at 2,000 Hz and 4,000 Hz.

Limitations of the Study

A few study limitations should be noted. First, in this investigation, the various FM/HA ratios were achieved by attenuating HA gain. We chose this approach because it was the standard approached used and the only adjustment allowed at the time by the amplification systems studied in this investigation. Rowson and Bamford (1995), however, caution against varying the FM/HA ratios by attenuating the HA gain levels, as this would negate the use of the FM+HA condition by limiting the subject’s access to sounds through the HA microphone. Boothroyd and Iglehart (1998), on the other hand, used the opposite approach in their investigation. In their study, the HA setting was held constant and the FM microphone sensitivity was increased. In this manner, they ensured that study participants experienced appropriate HA gain throughout all aided test conditions. The electroacoustic analyses we conducted in this investigation suggest that the study participants most likely did not have the appropriate gain from the HA for their given hearing losses when the higher HA attenuation levels were evaluated.

A second study limitation relates to our study sample. Because the study was designed as a pilot investigation, only 10 subjects were assessed. This limited sample could have caused the lack of statistical significance between some of the listening conditions.

Three other limitations are related to the methodology we used to assess speech-recognition performance. First, we used an adaptive procedure in which the speech signal was varied and the noise competition was held constant. It is possible that this adaptive procedure affected the results obtained in the aided listening conditions. To explain, typical input levels at FM
transmitter microphones are between 80 and 95 dB SPL (Crandell, Smaldino, & Flexer, 1995). Such input levels would be above the input automatic gain control (AGC) of the FM transmitter microphone. Specifically, the compression kneepoint of an FM transmitter is between 72 and 75 dB SPL. Therefore, by adaptively varying the intensity of the speech signal, we created listening conditions in which the input signal was below the AGC kneepoint for some subjects in the aided listening conditions. This situation—in which soft speech is presented to the FM transmitter microphone—is not likely to occur often in everyday listening environments and may limit the real-world applications of these results. An alternative would be to hold the speech constant and adaptively vary the noise. Some investigators (e.g., Killion, Niquette, Gudmundsen, Revitt, & Banjaree, 2004; Lewis, Lilly, Hutter, Bourdette, Saunders, & Fausti, 2006a, 2006b) have used this approach to assessing speech recognition in noise. Wagener and Brand (2005) have shown that both methods produce equivalent results. New guidelines published by the American Academy of Audiology (2008), however, caution against the use of this adaptive procedure in the verification of FM technology, as it may result in noise levels that are atypical in everyday listening environments. Fixed speech and noise levels should be considered in future work. To avoid the potential of ceiling and floor effects, multiple test levels should be used so that comparisons can be made across subjects and listening conditions.

Second, we tested speech-recognition measures for the two listening situations in a semi-sequential manner rather than simultaneously (i.e., speech presented from the 0° loudspeaker and from the 90° loudspeaker at the same time). When there are simultaneous inputs into both the FM transmitter microphone and the HA microphone, the input signals are summed and compressed together, which results in a greater SNR than would be seen with sequential measurements (Lewis & Eiten, 2003; Platz, 2004, 2006). While true simultaneous testing would have been difficult to accomplish, the testing methodology used in this study likely had an impact on the results. In the real world, people are likely to have two inputs presented to the system at the same time rather than sequentially, as in our investigation.

Third, only one type of hearing instrument and one type of FM system were evaluated in this investigation. Results with other types of instruments may not be comparable.

A final limitation involves the AI calculations, which were performed on the SNR values that were predicted to have occurred at each listener’s ear after HA and FM gain had been applied for each listening condition at levels corresponding to 0 dB SNR. While these values indicate the relative information available at 0 dB SNR, the actual levels presented to the listeners during the adaptive procedure were quite different and would in many cases have exceeded the point at which the AGC compressor would have become active, thus changing the SNR from the values calculated. This factor does not affect the main point of the AI calculations, which was to demonstrate the inverse
relationship between the AI at 0 dB SNR and the SNR needed for 50% sentence recognition. It does, however, demonstrate an important limitation of the AI calculation; that is, it is independent of overall level only if the levels of speech and noise are changing together. Once compression is applied in such a way that level is reduced for the noise independently of the target level (or vice versa), AI values will change in ways that can be predicted only by knowing the new gain values. This caveat is relevant for clinicians using AI calculations provided by real-ear measurement systems.

**Conclusion**

The results obtained for the loudspeaker located at 0° azimuth showed that the SNR for 50% sentence recognition was best at the three highest HA attenuation levels (20 dB, 30 dB, and 40 dB) and that there were no differences in the SNR for 50% sentence recognition among these three settings. Similarly, the results obtained from the loudspeaker located at 90° azimuth revealed that the poorest SNR for 50% sentence recognition occurred at the greatest HA attenuation level (40 dB) and that there were no significant differences in the SNR for 50% sentence recognition among the other listening conditions. On the basis of these preliminary findings, an HA attenuation level of 20 dB should be considered as a compromise for maximizing audibility in both listening situations.

**Acknowledgments**

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**References**


Commentary

Revisiting Labels: “Hearing” or Not?

Ellen A. Rhoades, Ed.S., LSLS Cert. AVT

Introduction

This position paper briefly presents evidence-based findings pertaining to the language of labels for people with hearing loss that relate to stigma, expectation levels, stereotypes, and self-fulfilling prophecies. These constructs are important for auditory-based practitioners, administrators, policymakers, students, families, and persons with hearing loss. The implications of what is written and said about people with and without hearing loss should be judiciously considered. Researchers and practitioners should avoid classifying children with typical hearing as “hearing,” because this implies that children with hearing loss do not hear — a stereotype largely rendered obsolete as a result of hearing technology and the early intervention practices of the 21st century.

Cursory examination of the literature shows that labels used to describe a person with hearing loss, and hearing loss as a condition, vary from person to person and from organization to organization across the span of cultures (Power, 2007). Uncertainty about terminology may reflect an emerging paradigm shift in attitudes. In our quest to become more sensitive and nonjudgmental about differences, we try to employ less contentious terms. Researchers and practitioners are constantly being challenged to rethink the nature of differences and disabilities (Kielhofner, 2005).

Terminology: Labeling and Stigma

Decades ago, hearing impairment was categorized as a physical condition at the organ or system level, specifically a loss of hearing acuity. Hearing disability reflected the functional consequences of a hearing impairment. Hearing handicap was classified as the social consequence of the impairment, representing an effort to capture the restrictions at the environmental level (WHO, 1980).
These terms are based on a medical model in which the difference is treated like an illness or disorder that needs to be cured or managed to attain more typical outcomes.

Terms currently used by published researchers to describe the condition include hearing impairment, hearing loss, hearing deficit, hearing defect, hearing handicap, limited hearing, hearing disability, deaf, and hard of hearing. These terms of deviance can easily activate certain negative attitudes (Greenwald & Banaji, 1995). While the disability literature indicates that writers should refer first to the person and then to the hearing loss, this has not yet occurred on a consistent or worldwide basis, regardless of whether researchers and practitioners live in developed or developing nations (e.g., Berg, Papri, Ferdous, Khan, & Durkin, 2006; Levi, Tell, & Cohen, 2004; Moog, 2002; Prasansuk, 2000; Westerberg et al., 2005). The issue is further complicated because placing the person ahead of the label is not necessarily the preferred approach for some members of Deaf culture (Leigh, 2009).

People without a hearing loss are often classified as “hearing” or “normal” (e.g., Keilmann, Limberger, & Mann, 2007; Ladd, 2003; Rydberg, Gellerstedt, & Danermark, 2009) versus “deaf” or “hearing impaired.” This practice may presume that people with a hearing loss do not hear at all or are abnormal, and may create an us-versus-them mentality based on in/out or favored/disfavored groups and predicated on policies, exclusionary practices, and human tendencies (Hinde, 2007; Israelite, Ower, & Goldstein, 2002; Marom, Cohen, & Naon, 2007; Ng, 2007; Silver, 2006; Wilson, 2004). These simplified group labels can have dramatic negative effects that are patently unfair; thus such labels shunned by many children and adults with hearing loss (Hughes, 2009; Richardson, Woodley, & Long, 2004).

Children and adults may still be referred to as “suffering from hearing defects” or “the deaf and hard of hearing” or “the hearing disabled.” In these instances, hearing loss is treated as a disease and the people may be objectified (Al Khabori, 2004; Bauman, 2004). We continue to have organizations and schools “for the deaf and hard of hearing” and “deaf schools” (Bat-Chava, 2000). Similarly, we continue to have universities that provide training for teachers in “deaf education.” Some service delivery systems, practitioners, and researchers are perpetrators of deviant labeling and stigma (Dudley, 2000) (see Figure 1). This is not to imply that the word “deaf” is pejorative in and of itself, but rather that the context or syntax may be perceived as such by various segments of the population.

For many people with a hearing loss, these deficit-based phrases are disrespectful and emotionally negative, implying that anything other than typical hearing is considered a personal tragedy (Kielhofner, 2005). The ambiguity of such “insufficient hearing” labels can leave some children feeling educationally and socially marginalized. For example, many mainstreamed adolescents with mild-to-moderate or severe hearing loss seem to find the term “disability” problematic; they refuse to self-label as “hard of hearing” or as
A cornerstone of both sociology and psychology is that what people believe has real consequences. Beliefs shape reality.

**Labeling theory** assumes that perceived negative societal reactions lead to the development of negative self-concepts (Lemert, 1951). People tend to act in accordance with the labels that others assign them (Mead, 1934).

**Stigma** refers to negative social meaning or stereotype assigned to a group when their attribute is considered different from or inferior to societal norms. The negative attribute is felt to be deeply discrediting in particular social interactions. This reflects spoiled identity and is instrumental in restricting one’s ability to develop one’s own potential. The extent of stigma may be affected by the age of one with atypical hearing (Erler & Garstecki, 2002; Goffman, 1963).

Figure 1. Labeling and stigma.

having a “hearing disability” (Kent, 2003; Richardson et al., 2004). Among the possible effects that accrue from the stigmatization of labels are bullying and social exclusion, reduced life opportunities, and a focus on within-child deficits to the exclusion of positive factors (Lauchlan & Boyle, 2007). Stigma-related stress has been associated with psychological distress (Hatzenbuehler, Nolen-Hoeksema, & Dovidio, 2009), which, in turn, may negatively affect learning and problem solving (Kassam, Koslov, & Mendes, 2009). The fact that labels can have an insidious effect on attitudes and expectations thereby creating invisible barriers for people with hearing loss has long been uncontested (Downs & Rose, 1991; Hergenrather & Rhodes, 2007).

By the same token, using the more benign labels of “mild,” “slight,” or “minimal” hearing loss can cause an underestimation of the potential problems faced by children with unilateral, fluctuating, or mixed hearing loss of 15-40 dB (Ross, 2001). Moreover, labeling can affect the perceptions and attitudes of policymakers and practitioner students, thus influencing future delivery of services. The labeling issue and its stigmatizing effects are quite complex (Erler & Garstecki, 2002; Leigh, 2009; Weisel & Tur-Kaspa, 2002). A concerted global effort is required to discredit the deficit label. People should be sensitive
to the issue of labels, while recognizing the existence of differences between those with and without hearing loss (Calderon, 1998). Because labels often come laden with stigma, we must take great care in our choice of words.

There is a need to engage in the process of de-labeling or relabeling to change public opinion so that people with atypical hearing are no longer stigmatized (Davis, 2007). Further research is needed to define the issues of self-labeling among children and adults who functionally hear using current hearing technology (Anglin & Whaley, 2006). Likewise, research is needed to determine the effects of any reclassification system on practitioners, peers, parents, and other members of the community including those with hearing loss. There is a need to view hearing loss from different perspectives (Fitch, 2002; Ho, 2004).

Until the effects of new terminology on public attitudes are better understood, perhaps the general descriptor categories of *typical hearing* and *atypical hearing* or *hearing differences* would be more neutral and apolitical, less emotionally charged, and less likely to affect expectations. In addition to possibly avoiding a negative corollary, the label *atypical hearing* might serve to normalize hearing loss as just another condition. A person with atypical hearing might then be understood as being in a world composed of millions of people with atypical, value-neutral situations or conditions.

Current World Health Organization (WHO) classifications reflect differences from a biopsychosocial perspective (WHO, 2002). WHO’s International Classification on Functioning, Disability, and Health reflects a paradigm shift as disability has come to be framed within the person-environment interaction. As a conceptual framework, it defines the domains of each person’s functional status, facilitating documentation of specific communication disabilities (Simeonsen, 2003). This framework places the focus of auditory learning and rehabilitation on optimizing activities rather than on impairments and disabilities, and recognizes the personal and subjective dimension of intervention outcomes.

### Expectations and Stereotypes

A specific belief about a person’s capabilities and future status in a community is an expectation. As children mature, expectations condition their behaviors. Expectations of parents, peers, practitioners, and institutions are typically based on group labels and implicit attitudes, and can significantly condition child behaviors (Dunham, Baron, & Banaji, 2006; Morgan, 2006). The expectations of others tend to define the expectations that one internalizes as their own educational and occupational aspirations. The power of expectation, known as the Pygmalion effect, has been documented in a variety of situations and ultimately affects a child’s performance. Expectations are central mediating variables in achievement, academic or otherwise (Morgan, 2006; Sanders, Field, & Diego, 2001).
Although people with varying disabilities may be stigmatized and stereotyped (Ahlborn, Panek, & Jungers, 2008), it can be argued that those with mild disabilities or certain diagnostic labels are a bit less stigmatized than others (Callaway, 2000; Huang & Diamond, 2009). Nevertheless, just as racism, sexism, and ageism exist (Tenenbaum & Ruck, 2007), so does “audism” (Baumann, 2004), which is the bias and prejudice of typically hearing people against people with hearing loss. Audism can be blatant or subtle, and can present itself in the form of a condescending or patronizing attitude, or even with an “inspirational” slant in which hearing loss is seen as a divinely assigned characteristic.

The greatest handicap for children with hearing loss may be the limited expectations and unfair predictions of the adults and peers who live, work or socialize with them. For example, when one conveys to others that a child is a slow learner, others will expect that child to learn rather laboriously and the child will likely live up to those expectations (Jones, 1977). Indeed, it may be that humans have an innate tendency to use stereotypes for people dissimilar to themselves (Jenkins, Macrae, & Mitchell, 2008).

Especially as a result of hearing technology and auditory-based interventions, parental expectations are evolving, becoming more positive and hopeful (Sach & Whynes, 2005; Wu & Brown, 2004; Zaidman-Zait & Most, 2005). These higher expectations are not just for improved listening and spoken language skills, but also for the interpersonal relationships and academic achievements of their children. Interestingly, variables such as a child’s age at time of implantation or length of time using a cochlear implant do not seem to affect parental expectations (Zaidman-Zait & Most, 2005). Longitudinal research is needed to examine whether changes in parental expectations are consistent over time and to determine whether these changes are linked to adolescent or adult outcomes. Such research would enable a better understanding of the role parents play in the intervention process and, in turn, improve practitioner services and program outcomes.

With the advent of current hearing technology and the continuing expansion of newborn hearing screening and early intervention programs in developed and developing countries (Ozcebe, Serine, & Belgin, 2005; Swanepoel, Hugo, & Louw, 2006), prognostic expectations will continue to rise among practitioners and parents (Moog, 2002). But despite these opportunities, research findings show that stereotypes deter many people from realizing their full potential (Aronson, 2002). Because many children and adults with hearing loss are intuitively aware of attitudinal barriers (Punch, Creed, & Hyde, 2006), they may engage in selective self-disclosure of either their hearing loss or the hearing technology they use (Kent & Smith, 2006). This intuition can be considered a cognitive adaptation to avoid negative social contact (Kurzban & Leary, 2001). Being chronically self-conscious about the stigmatized status accorded to hearing technology can deter some children and adults from taking optimal advantage of the technology (Brown & Pinel, 2003; Pachankis, 2007; Strange,
Johnson, Ryan, & Yonovitz, 2008). In their effort to conceal the use of hearing technology, some children and adolescents may experience considerable stress that can have an additional powerful negative impact on their daily lives (Pachankis, 2007).

The threat of stereotype, which is similar to, for example, test anxiety, is a negative affective state that is a general threat to one’s sense of self-integrity (Steele, 1997). This threat can reduce a person’s cognitive resources by co-opting the verbal working memory needed for task performance (Beilock, Rydell, & McConnell, 2007). The social self plays an essential role in stereotype threat, increasing the person’s self-doubts and concerns about how he or she will be perceived (Beilock & Carr, 2005). The fear of being judged by a group stereotype can create pressure-filled situations that impair a person’s self-knowledge by squelching opportunities to learn from feedback and, thus, hindering development of a self-concept (Aronson & Inzlicht, 2004; Marx & Stapel, 2006; Wout, Danso, Jackson, & Spencer, 2008). In short, the stereotype threat created by a very capable but atypically hearing person’s social context can be a powerful obstruction to the realization of that person’s intellectual potential (Aronson, 2002; Ben-Zeev, Fein, & Inzlicht, 2005). Research is needed to understand the mediators of stereotype threat so that effects of negative stereotypes can be minimized (Beilock et al., 2007; Wout et al., 2008).

**Self-Fulfilling Prophecies**

The term “self-fulfilling prophecy” refers to a situation where a person’s expectation of an event causes the actual occurrence of that event (Jones, 1977). That expectation can be considered a subjective judgment regarding the likelihood of a future event to occur. Moreover, the one who expects the event to occur can be considered a causal agent, albeit perhaps unwittingly so (Haimerl & Fries, 2010). Alternately stated, a self-fulfilling prophecy is an erroneous belief that leads to its own fulfillment (Merton, 1948). Evidence for the insidious effects of the self-fulfilling prophecy across varied contexts is uncontested (Rosenthal, 2002).

Self-fulfilling prophecies have the potential to create profound social problems, unfair intervention practices, and abysmal individual performance (Madon, Guyll, Spoth, & Willard, 2003). Research confirms that children can have a self-fulfilling prophecy effect on their parents. For example, the diagnosis of a hearing loss in a child may cause some parents to lower their expectations for what can be accomplished by their child (Madon, Guyll, & Spoth, 2004). But the self-fulfilling prophecy effect is not necessarily reciprocal, perhaps because parents have more power in the relationship. This means that parents’ hearing loss is less likely to affect children’s expectations of their parents. Moreover, negative self-fulfilling prophecies may be more powerful than positive ones (Madon et al., 2004). Self-fulfilling prophecies involve complex interpersonal and intrapersonal issues that warrant further study among
people with hearing loss along a continuum of educational, communicative, and familial variables.

In summary, expectations, stereotypes, and self-fulfilling prophecies can profoundly affect people with atypical hearing. Labels can negatively affect expectations. These expectations condition behaviors, which ultimately become self-fulfilling prophecies. Thus, future behaviors are modified and the resulting performance can further alter self-perceptions, expectations, and one’s self-concept (see Figure 2). This cycle can adversely affect people with hearing loss throughout their lives, condemning them to live in a state of incompetence.

An Evidence-Based Call for Change

Current hearing technology has given the sense of hearing to many children who would previously have been considered deaf (Geers, Tobey, Moog, & Brenner, 2008; Rhoades, 2010). These children can learn language naturally and primarily through the auditory channel. It is time for researchers in comparative studies to stop referring to persons with typical hearing as “hearing,” because this perpetuates the presumption that children with hearing loss do not hear. Current technology has certain limitations and does not enable children with hearing loss to hear typically; nevertheless, children with audiometric deafness who benefit from hearing technology should be considered hearing rather than nonhearing. In fact, categorizing these children as other than hearing may affect the outcomes of studies (Grönvik, 2009). It is important that researchers engaged in studies involving children with hearing loss are sensitive to the potentially deleterious effects of labeling, which can take them into the domain of identity politics.

Practitioners who implement auditory-based practices persistently strive to modify parental expectations for their children. Many parents of children with hearing loss fully embrace the notion that their children hear, albeit differently than children with typical hearing. For these families, their children with hearing loss are functionally hearing. Likewise, many children with hearing loss who learned to listen while they were young consider themselves as hearing when they enter adolescence and adulthood. To those parents and older children, research findings that categorize children as hearing and otherwise can

Figure 2. Essential principles of the self-fulfilling prophecy.
be confusing and demeaning. It seems unwise, unfair, and offensive – even if it is done unwittingly – to compromise the long-term efforts of families and auditory-based practitioners with the use of labels.

Some may consider this call for a change in terminology to be a philosophical point. However, given the overwhelming evidence for labeling theory, stigma, and the self-fulfilling prophecy, this is not a matter of philosophy or a communication option. The fact is that some children with hearing loss are functionally hearing as unequivocally demonstrated in neurobiological and audiological findings (Johnson, 2009). These children and their families deserve to be accorded that sense of achievement.

Some researchers might say that it would be cumbersome or awkward to consistently refer to children as “typically hearing” or “atypically hearing” throughout a research paper. But most researchers, in accordance with the WHO standards, have no trouble referring to “children with severe-to-profound hearing loss” rather than “deaf children.” No longer comparing “hearing” children to those with hearing devices may promote a positive self-fulfilling prophecy effect on practitioners, administrators, parents, and their children. Researchers are urged to think about the labels they assign to the groups they study, especially if their findings are reported in publications read by persons who embrace the use of hearing technology coupled with auditory-based intervention practices.

As Ng (2007) said, “Power is the master and language is its servant” (pp. 118).

References


“Hearing” or Not? 63


The book “Early Development of Children with Hearing Loss” by Susan Nittrouer, Ph.D., is an interesting, clearly written book with a very ambitious purpose. That purpose, as stated in the preface, is to report the results of an investigation into factors influencing language development in order to help parents make informed decisions, and to “help shape the way we approach treatment for children with hearing loss as we go forward into the 21st century.” The language development of children who are deaf and hard of hearing over the first four years of life is analyzed and examined using three major independent variables: age of identification, use of sign language to support spoken language acquisition, and effectiveness of various prosthesis combinations (hearing aids and cochlear implants). The results of this research were published in a single book rather than a series of articles to make the information relevant for professionals, who would use it as a reference manual, and for nonprofessionals, such as parents, who would use the information in determining communication approaches for their child with hearing loss.

For some readers, including parents, there may be too much research information in spite of the fact that the author carefully explains procedures and often moves data to the end of chapters to improve readability. However, this format would appeal to nonprofessionals and graduate students who are interested in learning the process researchers go through when asking questions and making decisions. The book would be particularly valuable to someone new to the field and interested in doing research with individuals who are deaf and hard of hearing. Not only does the author clearly discuss the selection of measurement instruments, independent and dependent variables, and analysis procedures, but she also makes this information very accessible by modeling thinking, thus providing valuable insights into the research process. Readers who are not interested in the process can go directly to the end of the chapters, where concise summaries provide key information.

Of course, the author’s attempt to satisfy various audiences leads to some interesting decisions, and even some problems, regarding the presentation of information. While the presentation is probably too technical for a lay audience, the book’s lack of sufficient detail and specificity provide a barrier to a scientific audience. In the chapters on outcomes, statistical results are not presented fully, forcing the reader to accept the author’s findings and interpretations.
without scrutiny. By publishing the results in book form, the author escaped the rigorous scientific scrutiny the research would have received had it been subjected to blind peer review.

The author explicitly states that one goal of the research is to examine the accuracy of the assumption that cochlear implants enable children who are deaf and hard of hearing to acquire spoken language at the same rate as children with typical hearing. This is a valiant effort, as this assumption is often treated as fact in many circles promoting cochlear implants. Indeed, one of the main contributions of this book is that, based on data, the author challenges this assumption and claims that while cochlear implants are superior to hearing aids, there is still a gap in the language growth curves of children using implants vs. children with typical hearing. The author makes a genuine effort to investigate and document what works and to search for evidence-based practice. The main factors she investigates are age of identification, use of sign language, parent socioeconomic status, parent child interaction, and the use of cochlear implants.

The author also attempts to go beyond the study of individual measures and simple relationships to create a model based on Bayesian strategies for explaining complex relationships. Even though she carefully explains modeling procedures, the chapters describing and testing the model are very technical and, again, probably not accessible to a nonprofessional audience.

In chapter 1, “A shared history: Putting this book in cultural perspective,” the author provides background on language learning and speech perception, discussing historical perspectives and controversies. She concludes by stating that the study will examine “how we are doing now, at the turn of this century, in how we provide services to young deaf children.”

In chapter 2, “The emergence of language,” the author discusses how and why we communicate and what we know about the language capabilities of children with hearing loss. She ends the chapter with a discussion of her belief that language is a highly developed motor activity, and that understanding it necessitates understanding the systems that produce and perceive it.

In chapter 3, “Development of children with hearing loss: State of our knowledge,” the author discusses the importance of considering how well a child uses language in everyday interactions, and how quality communication between parent and child influences psychosocial development.

With chapter 4, “Participants and procedures: How independent sources of variability were handled,” the author presents an in-depth look at the research endeavor. She discusses participant selection and exclusionary criteria, and provides access to the thinking of a researcher as she creates and designs an experimental investigation.

In chapter 5, “Behavior, personality, and cognition,” the author begins to present data from the study, focusing on behaviors “unrelated to language.” These include social behavior, cognition, adaptive behavior, fine and gross motor skills, and social interaction skills.
In chapter 6, “Basic language measures: comprehension, vocabulary, and intelligibility,” she discusses assessment instruments and measurement issues relevant to clinicians, focusing on the difficulty of finding sensitive indices of language acquisition. She also analyzes the effect of sign language use, and concludes that for early-identified children, signs neither facilitate nor inhibit spoken language learning.

In chapter 7, “Language in the real world: What we learn from language samples,” the author explains that clinical assessment tools do not provide an accurate picture of the way in which children use language in natural settings. In this chapter, the author takes a real world approach to inform parents and teachers of relevant outcomes, focusing on what really matters.

In chapter 8, “Real-world language: Developing native competencies,” the author sets out to address two issues: how well children are mastering the nuances of native language, and how children communicate when language abilities lag cognitive and pragmatic development. In the chapter summary, she suggests that conventional measures, as reported in earlier chapters in the book, “may be underestimating the amount of delay experienced by many children with hearing loss” (pp. 217).

In chapter 9, “Treatment effects,” the author examines factors that best facilitate positive language outcomes. She finds that continuing use of a hearing aid after receiving a cochlear implant is beneficial, and that simultaneous bilateral cochlear implantation is not justified. She also finds that children in auditory-oral and auditory-verbal programs perform similarly, and that parental signing did not influence language outcomes. Most importantly, the author finds that there are very few children with hearing loss who were acquiring language at a rate similar to that of a child with typical hearing.

In chapter 10, “All about parents,” the author investigates parental stress, as well as form and function of the language used in parent-child interaction. An important finding was that parental responsiveness to their own child’s communication attempts has a positive influence on language outcomes.

In chapter 11, “Putting it all together: A latent measure of language acquisition,” the author uses a sophisticated modeling strategy to create a composite variable of language development. The model confirms that sign language does not help nor hurt unless the child is identified late, in which case signing has a deleterious effect on English language learning. It also confirms that parental interaction style is important, and that children do best with a second cochlear implant as long as they receive it after a period of time and use a hearing aid with the initial implant.

In the last chapter, chapter 12, “Considering the past, planning for the future,” the author presents an interesting, thought-provoking argument for improving intervention by changing the prevalent view of what’s involved in spoken language use. Herein is the primary value of the book. She challenges some strongly held beliefs about intervention for spoken language learning, such as the use of a hierarchical approach to listening instruction and a focus.
on discriminating phonemes in the input signal. Moreover, she stresses the importance of top-down vs. bottom-up processing in speech perception, and of the integration of visual and auditory information in discovering the meaningful structure of spoken language.

However, if the book is to function as an expanded article, the last chapter must be criticized, because the summary and implications are not motivated by prior information. The author’s suggestions, while appealing, are not based on the findings reported in previous chapters. This is disappointing and problematic for the scientific reader, especially since the author has argued for evidence-based decisions. If this book was written as a series of chapters instead of an expanded article, this chapter could have stood alone as an effective call for action. The author is right in calling for ongoing exploration of effective intervention strategies, given that individuals with cochlear implants are still lagging behind individuals with typical hearing in their acquisition of spoken language.

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Expanding Children’s Hearing Opportunities (ECHO) Program at Carle Foundation Hospital, 611 West Park Street, Urbana, IL 61801 • Phone: (217) 383-4375 • Email: echo@carle.com • Website: www.carle.org/ECHO • The Expanding Children’s Hearing Opportunities (ECHO) Program was established in 1989 to serve children with hearing loss and their families. ECHO has grown to encompass two programs: the Pediatric Hearing Center (PHC) and Carle Auditory Oral School (CAOS). PHC provides audiologic, speech language, and early intervention services as well as an experienced pediatric cochlear implant team. CAOS supports children with hearing loss in developing their spoken language and listening skills from preschool through second grade.
New York

Nazareth College Deafness Specialty Preparation Program – Rochester, NY (joint program with National Technical Institute for the Deaf) • Point of Contact: Paula Brown, PhD, CCC-SLP • Email: Pbrown8@naz.edu • Phone: (585) 389-2796 • Website: www.rit.edu/ntid/spslp. The Nazareth College Deafness Specialty Preparation Program in Rochester, NY, prepares graduate students in Speech-Language Pathology for work with children who are deaf or hard of hearing, especially those with cochlear implants. This joint program with the National Technical Institute for the Deaf provides specialized coursework and practica in spoken language and auditory assessment and intervention.

North Carolina

FIRST YEARS – Kathryn Wilson, Program Director • Phone: (919) 966-0103 • Email: Kathryn_wilson@med.unc.edu • Administered by the University of North Carolina-Chapel Hill, FIRST YEARS is an in-service, certificate program committed to enhancing the knowledge and skills of professionals practicing in deaf education, speech-language pathology, audiology, and early intervention. The FIRST YEARS courses in listening and spoken language development combine convenient distance education with a hands-on mentorship experience to meet the needs of practicing professionals.

Australia

University of Newcastle – GradSchool, GradSchool Services Building, University of Newcastle, Callaghan, NSW 2308, Australia • Phone: +61249217373 • Fax: +61249218636 • Master of Special Education, distance education through the University of Newcastle. The program provides pathways through specializations in:

- Generic special education
- Emotional disturbance/behavior problems
- Sensory disability
- Early childhood special education

The Master of Special Education (Sensory Disability specialization) is available through the Renwick Centre, which is administered by the Australian Royal Institute for Deaf and Blind Children. Program information and application is via GradSchool: www.gradschool.com.au, +61249218856, or email gs@newcastle.edu.au.
Psychosocial Potential Maximization: A Framework of Proactive Psychosocial Attributes and Tactics Used by Individuals who are Deaf
By Paul Gordon Jacobs, Ph.D.

A Pilot Investigation Regarding Speech-Recognition Performance in Noise for Adults with Hearing Loss in the FM+HA Listening Condition
By M. Samantha Lewis, Ph.D., CCC-A, FAAA;
Frederick J. Gallun, Ph.D.; Jane Gordon, M.S., CCC-A;
David J. Lilly, Ph.D., CCC-A, FAAA;
and Carl Crandell, Ph.D., CCC-A, FAAA.

Revisiting Labels: “Hearing” or Not?
By Ellen A. Rhoades, Ed.S., LSLS Cert. AVT