

EMPIRICAL MANUSCRIPT

Language and Psychosocial Functioning among Deaf Learners with and without Cochlear Implants

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Abstract

Various studies have examined psychosocial functioning and language abilities among deaf children with and without cochlear implants (CIs). Few, however, have explored how relations among those abilities might change with age and setting. Most relevant studies also have failed to consider that psychosocial functioning among both CI users and nonusers might be influenced by having language abilities in both signed and spoken language. The present investigation explored how these variables might influence each other, including the possibility that deaf individuals' psychosocial functioning might be influenced differentially by perceived and actual signed and spoken language abilities. Changes in acculturation and quality of life were examined over their first year in college, together with changes in perceived and assessed language abilities. Students with and without CIs differed significantly in some aspects of psychosocial functioning and language ability, but not entirely in the directions expected based on studies involving school-aged deaf students. Participants' cultural affiliations were related as much or more to perceived language abilities as to the reality of those abilities as indicated by formal assessments. These results emphasize the need to consider the heterogeneity of deaf learners if they are to receive the support services needed for personal and academic growth.

The present study examined psychosocial functioning among deaf¹ college students as it might be affected by their sign language and spoken language abilities and use of cochlear implants (CIs). The study had two specific foci. One focus was how cultural identity and quality of life among deaf students (with and without CIs) might change over a first year of college when immersed in a Deaf community. The second focus was the previously unexplored possibility that deaf students' perceived and actual language abilities might be related differentially to their cultural identities and quality of life. Previous studies have explored relations of CI use and quality of life among deaf children, language modality (signed vs. spoken language) and cultural identity among deaf adolescents, and language modality and quality of life among deaf adults. However, CI use, quality of life, cultural identity, and language modality have not been considered previously in a single study. Of particular interest

here were possible interactions among those factors, as well as the influence of perceived versus actual language abilities, during the first year of college, when deaf and hearing youth go through significant social-emotional transitions.

As young people transition from secondary to postsecondary educational settings, they are assumed also to transition from adolescence to young adulthood. Arnett and Taber (1994) described this period as the overlapping shift from adolescence, at ages 11–19 years, to emerging adulthood, 18–25 years. Arnett (2000) emphasized the latter as a period of identity exploration and frequent risk-taking behavior as individuals come to gain self-sufficiency and independence. As difficult as such changes are for some individuals, entering college or some other post-secondary setting can be particularly challenging for students with hearing loss, who will need greater levels of self-advocacy to navigate communication barriers, access issues, and support

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services (Barnard-Brak, Sulak, Tate, & Lechtenberger, 2010; Powell, Hyde, & Punch, 2014). Postsecondary life also will require adapting to social interactions and social networks that may be unfamiliar and less welcoming than those to which deaf youth are accustomed. Some college programs are specifically aimed at deaf learners or have offices designed to support students' psychosocial as well as academic functioning, but the impact of such programs on students' quality of life has not been explored as yet.

Language, CI Use, and Cultural Identity Among Deaf Adolescents and Young Adults

After years of schooling in mainstream settings, deaf adolescents often develop greater awareness of and attraction to Deaf culture and the Deaf community (Maxwell-McCaw & Zea, 2011). This awareness has the potential to support identity development (Leigh, 2009) but also the potential to create identity confusion (Kersting, 1997; Wald & Knutson, 2000). At the same time, the increasing prevalence of CI use and younger ages of implantation now give many more deaf learners the opportunity to use spoken language in educational and social settings and thus perhaps a greater likelihood of affiliating with the hearing world rather than the Deaf community (Knoors & Marschark, 2012).

A variety of studies has examined the impact of CI use on psychosocial functioning, language abilities, and peer interactions in children. Despite such investigations, answers to some basic questions and the ability to predict outcomes of CI use in these domains remain elusive. Such questions are complicated by interactions among factors contributing to the heterogeneity of CI users (e.g., pre-implant language and cognitive abilities, age of implantation, levels of family support) as well as, perhaps, the frequent assumption that CI users depend exclusively on spoken language. By the time CI users enter college, that assumption may not hold, and the use of both spoken language and sign language (and their relative balance) may well influence functioning in cognitive, academic, and psychosocial domains (Marschark et al., 2015; Marschark, Zettler, & Dammeyer, 2017; Spencer, Tomblin, & Gantz, 2012; Warner-Czyz, Loy, Evans, Wetsel, & Tobey, 2015). More generally, only rarely have investigations of such outcome variables considered the fact that deaf learners—with or without CIs—might utilize both signed and spoken language, and studies examining changes in language skills and related outcomes over time are scarce (but see Kersting, 1997; Kunnen, 2014). Beyond childhood, possible psychosocial implications of sign language or spoken language use (e.g., for deaf or hearing acculturation) have not been examined in contexts that might encourage changes in identity or affiliation. Relevant studies involving deaf adolescents and college students, however, have provided both real-world and empirical information concerning the foundations of psychosocial functioning during the postsecondary years.

College enrollment and degree completion by deaf individuals have increased dramatically over the past several decades (Kelly, Quagliata, DeMartino, & Perotti, 2016; Newman, Wagner, Cameto, Knokey, & Shaver, 2010). The vast majority of those students will be in contexts where instruction is via spoken language, perhaps with support from assistive technologies (e.g., FM systems, real-time text). Many deaf adults and others associated with the Deaf community, however, have strong feelings about the importance of sign language, Deaf culture, and schools for the deaf in the psychosocial development of deaf youth (Holcomb, 2013; Lane, Hoffmeister, & Bahan, 1996; Oliva,

Lytle, Hopper, & Ostrove, 2016). Studies by Glickman and Carey (1993) and Punch and Hyde (2011) suggested that deaf children (with and without CIs) who use spoken language may see themselves as audiological but not culturally deaf. As they become older, however, they may become more eager to explore sign language and deaf culture. In a study of identity among deaf adults, Ohna (2004) interviewed deaf 18- to 22-year-olds as well as 40- to 45-year olds. He reported a significant difference in cultural identities between the two age groups, as the older respondents were more deaf acculturated and expressed ambivalence toward hearing people. Ohna concluded that the older respondents were the only ones who could fully develop a Deaf identity. The study did not consider that the observed differences between the two groups might be a generational one, possibly influenced by technological advances and changing views of multicultural societies, nor did Ohna address the fact that identity is fluid. During the transitioning years of 18–22, in particular, identity may still be developing, especially among individuals who are less psychosocially mature, and postsecondary experiences are likely to have significant impact (Waterman & Waterman, 1971).

Kunnen (2014) interviewed a group of deaf adolescents, annually, between the ages of 14 and 18 years of age to examine changes in several aspects of psychosocial functioning over time. Her participants were all skilled signers attending a school for the deaf in The Netherlands. She found that compared to hearing norms, cultural identity development proceeded faster among the deaf students, with an earlier-maturing orientation toward "Being Deaf." Whether similar results would be obtained for deaf students attending inclusive, mainstream schools is unclear, but in many countries, the majority of deaf learners now attend such schools rather than special schools for the deaf. In fact, recent studies have found that deaf adolescents and young adults generally prefer to attend inclusive schools and use spoken language rather than sign language (O'Neill, Arendt, & Marschark, 2014; Van Gent, Goedhart, Knoors, Westenberg, & Treffers, 2012).

Whether or not such preferences are consistent with the views of some Deaf adults (e.g., Lane et al., 1996; Oliva et al., 2016), mainstream school attendance and spoken language use today usually are associated with better psychosocial functioning (Hintermair, 2011; Van Gent et al., 2012; Warner-Czyz et al., 2015). But, it is complicated. Van Gent et al. (2012), for example, found that while the self-worth of deaf adolescents was associated with attending mainstream schools, it also was linked to the use of sign language during childhood and better parent-child communication. Early use of sign language also was associated with greater social competence, even while the adolescents reported lower levels of social acceptance and fewer close friendships relative to hearing norms. The investigators noted, however, that they did not actually assess the adolescents' sign language and spoken language abilities, which might have mediated the association between school type and ego development. Warner-Czyz et al. (2015) found that 8- to 18-year-old CI and hearing aid users reported significantly greater self-esteem than hearing peers. Self-esteem was not significantly related to the participants' "communication prowess," and only self-rated spoken language abilities were considered.

Nikolarazi and Hadjikakou (2006) used a semi-structured, in-depth interview designed to explore factors contributing to identity formation among deaf individuals. Almost half of their informants were found to have deaf identities, about one-third had hearing identities, and the remainder had bicultural identities. Those deaf adults who had attended mainstream schools

with hearing peers and used spoken language were more likely to have hearing identities; those who had attended schools for the deaf with deaf peers and used sign language were more likely to have deaf identities. Bicultural identities were most common among individuals who had used spoken language and attended mainstream schools but also had deaf role models outside of school (see [Hintermair, 2008](#)).

Language, CI Use, and Quality of Life Among Deaf Adolescents and Young Adults

[Kushalnagar et al. \(2011\)](#) examined perceptions of quality of life among 230 deaf 11- to 18-year-olds as a function of their preference for sign language, spoken language, or a combination of signed and spoken language (“equal preference”). Quality of life was assessed using the Youth Quality of Life-Deaf and Hard-of-Hearing (YQoL-DHH) instrument ([Patrick et al., 2011](#)), which includes subscales relating to perceived stigmatization with regard to hearing loss, social participation, and self-acceptance/advocacy. Twenty-seven percent of their respondents used CIs, but their results were not reported separately (CI use was considered a different level of hearing loss). The only significant difference obtained was that deaf youth who reported a preference for spoken language scored higher on perceived stigma than those who reported use of both speech and sign, but the difference was small (40% vs. 36%). That finding may be a reflection of the former individuals’ straddling deaf and hearing worlds, but the YQoL-DHH does not include items distinguishing stigmatization from hearing versus deaf individuals.

[Schick et al. \(2013\)](#) explored the relation of school placement to perceived quality of life among 221 deaf 11- to 18-year-olds. As in the [Kushalnagar et al. \(2011\)](#) study, quality of life was assessed using the YQoL-DHH. When other factors were controlled, there were no significant differences on any of the subscales as a function of school placement, communication modality, degree of hearing loss, or CI use. CI users, however, showed lower levels of perceived stigma than individuals in any of the other hearing loss categories. [Hintermair \(2011\)](#) also examined quality of life among deaf youth. Participants from 6 to 18 years of age completed the Inventory of Life Quality of Children and Youth. Small but significant effects indicated that the deaf students reported poorer quality of life than hearing norms with regard to school experiences, physical health, mental health, and overall. Interestingly, spoken language was used in school by all of the participants, but those individuals with better self-reported sign language skills reported lower quality of life in the domains of school and mental health as well as overall.

[Chapman and Dammeyer \(2017\)](#) recently examined both quality of life and cultural identity among Danish adults. Individuals’ cultural identities were categorized as deaf, hearing, bicultural, or marginal (i.e., low in both deaf and hearing identity) on the basis of responses to the question “do you feel you have most in common with deaf or hearing people?” Chapman and Dammeyer found that individuals with marginal identities scored significantly lower in psychological well-being compared with individuals in the other three identity groups, which did not differ from each other. Adults indicating deaf or bicultural identities were significantly more likely to have attended schools for the deaf ([Kunnen, 2014](#); [Ohna, 2004](#)) and reported better sign language skills than individuals with hearing or marginal identities. CI use was significantly less likely among individuals with deaf identities than individuals in the other three identity groups.

Impact of CIs on Language and Quality of Life

A variety of investigators has reported that deaf youth experience greater self-confidence and social well-being after receiving CIs (e.g., [Dammeyer, 2012](#); [Hilton, Jones, Harmon, & Cropper, 2013](#); [Jambor & Elliot, 2005](#); [Leigh, Maxwell-McCaw, Bat-Chava, & Christiansen, 2009](#); [Warner-Czyz et al., 2015](#); [Wheeler, Archbold, Gregory, & Skipp, 2007](#)). [Archbold \(2015\)](#) and others, however, have indicated that the situation is complicated among adolescents and young adults, for whom the language demands are greater and the contexts of language and social interaction are more abstract and complex ([Dammeyer, 2010](#); [Hilton et al., 2013](#)).

Prior to the advent of CIs, deaf adolescents in mainstream settings were reported to experience loneliness and isolation (e.g., [Kluwin, Stinson, & Colarossi, 2002](#); [Stinson & Antia, 1999](#)). Such findings led to suggestions that CIs might leave children “stuck” between deaf and hearing worlds ([Christiansen & Leigh, 2002](#); [Most, Weisel, & Blitzler, 2007](#)). Current literature indicates that this did not happen in any general sense ([Archbold, 2015](#); [Leigh, 2009](#)). CIs give many deaf youth the opportunity to utilize speech and hearing, not in a manner fully comparable to hearing peers, but to a much greater extent than was possible previously. Spoken language use in the classroom and in social interactions clearly has limits for these individuals, but as technology, therapies, and social acceptance have changed in recent decades, CIs have allowed many deaf youth to develop more relationships with hearing peers and improved quality of life according to both deaf youth themselves and their parents.

Several studies have indicated that, among deaf adolescents and young adults who use spoken language—with or without CIs—there is some resistance to self-labeling as either deaf or hearing. Rather, they tend to see themselves as both depending on the context ([Archbold, 2015](#); [Hilton et al., 2013](#); [Leigh, 2009](#); [Most et al., 2007](#); [Spencer et al., 2012](#); [Wald & Knutson, 2000](#); [Wheeler et al., 2007](#)). But again, it is complicated. [Leigh et al. \(2009\)](#) examined the psychosocial adjustment and perceived quality of life of deaf 13- to 18-year-olds with CIs by comparing them to a group of deaf age-mates who had never used CIs. Individuals with CIs were significantly more hearing-acculturated than their peers without CIs, but those without CIs were only slightly more deaf-acculturated than their peers who were CI users. Concomitantly, 77% of the CI users preferred spoken language compared to 15% of the nonusers. There were no significant differences between the two groups in self-esteem, loneliness, or teacher and parent reports of student anxiety/depression or social problems.

[Spencer et al. \(2012\)](#) followed up a group of 18- to 29-year-old individuals who had received CIs between 24 months and 15 years of age. That study examined long-term educational, vocational, cultural affiliation, and quality of life outcomes, the last as indexed by the Satisfaction with Life scale of [Diener, Emmons, Larson, and Griffin \(1985\)](#). Overall, the group reported very high life satisfaction, higher than the hearing college students in the [Diener et al. \(1985\)](#) study. Most of the participants (87%) endorsed bicultural identities, perhaps because they were educated largely in total communication settings in which they used spoken language but also were supported by sign language interpreters. With age, the participants were more likely to report having bicultural identities.

Psychosocial Functioning, CIs, and Alternative Perspectives on Language

Although language abilities were not considered in the [Leigh et al. \(2009\)](#) or [Spencer et al. \(2012\)](#) results, actual language

performance (as opposed to preference) can be important. Dammeyer (2010) reported that children with good sign language or good spoken language skills following cochlear implantation reported psychosocial well-being comparable to hearing peers. Knutson, Boyd, Reid, Mayne, and Fetrow (1997), Bat-Chava and Deignan (2001), Jambor and Elliot (2005), and Wheeler et al. (2007) all found that deaf youth (or their parents) reported improved communication with hearing peers after cochlear implantation, although speech and hearing rarely improved sufficiently to be fully accepted by hearing peers. Such findings are consistent with those from studies involving deaf learners without CIs, as social interactions and social participation with hearing peers typically are associated with better spoken language skills (e.g., Most, Ingber, & Heled-Ariam, 2012).

More recently, Marschark et al. (2017) investigated language and cultural identity among college students as indicated by Maxwell-McCaw and Zea's (2011) Deaf Acculturation Scale (DAS). The DAS yields measures of deaf identity (DASd) and hearing identity (DASh) as well as four categories of cultural identity: deaf, hearing, bicultural, and marginal. In a sample of 119 deaf college students, Marschark et al. found that the strength of deaf identity did not differ significantly between CI users and deaf nonusers. Considered in terms of the DAS identity categories, CI users tended either to be bicultural (50%) or to have hearing identities (36%). The nonusers also tended to be bicultural (41%), while those who were not were evenly split between having hearing (27%) and deaf (29%) identities. When the same individuals were divided according to their primary mode of communication (signed or spoken) rather than CI use, 69% of deaf individuals who depended primarily on spoken language identified as having hearing identities, with 29% identifying as bicultural. Thirty-two percent of the signers had deaf cultural identities, with 57% identifying as bicultural. The authors concluded that deaf identity is more complex than might be assumed on the basis of CI use or language orientation alone, and suggested the need for further study.

The Present Study

The extent to which associations among CI use, cultural identity, quality of life, and language preferences and abilities might change as deaf youth transition from secondary education is still to be determined. However, first year college students are described (at least by parents and marketing companies) as impressionable and prone to identity shifts (e.g., Waterman & Waterman, 1971). The present study examined relations among language abilities and several measures of psychosocial functioning in deaf students with and without CIs as they entered college and again toward the end of their first year. The setting was a mainstream university, but one with a large Deaf community where new students are exposed to many sign language users and Deaf culture. Given the importance laid by many to deaf youth having deaf peers, sign language, and exposure to Deaf culture (e.g., Holcomb, 2013; Oliva et al., 2016), we anticipated a shift toward greater deaf acculturation by students with and without CIs in this setting. With a variety of opportunities to learn and use sign language, we also expected improvements in students' signing skills—or at least self-perceptions thereof. Alternatively, in attending a mainstream university, students with CIs, in particular, might shift toward greater hearing acculturation. Possible differences between perceived and actual language abilities with regard to psychosocial functioning were of particular interest given the reported importance of peer communication to well-being, quality of life, and cultural identity.

Perceived language abilities may be more important for psychosocial functioning than actual, assessed abilities, contributing to both identity formation and quality of life.

Method

Participants and Setting

The 57 participants were all first-year college students identified as receiving university services because of hearing loss. Twenty-seven of the participants were current CI users. The other 30 participants (henceforth, "nonusers") had never used CIs; three of them reported using a single hearing aid, and 15 reported using bilateral hearing aids. Participants ranged in age from 17.7 to 23.5 years with a mean of 19 years ($SD = 1.20$); the CI users and deaf nonusers were not significantly different in age. All participants were enrolled in Rochester Institute of Technology (RIT), were recruited through posters and personal contact, and were paid for their participation. RIT includes the National Technical Institute for the Deaf (NTID) as one of its nine colleges, but participants came from across the university. Deaf students make up approximately 9% of the RIT student body and, depending on their preferences and skills, may receive classroom instruction through spoken language (sometimes supported by real-time text) or through sign language either from the instructor (NTID classrooms) or a sign language interpreter (classrooms in other colleges). RIT thus is an inclusive academic environment where deaf (and hearing) students also have the opportunity to be exposed to sign language and Deaf culture. Regardless of the language orientations, deaf students receive access services beyond what they likely had experienced previously.

The CI users reported receiving their implants between 1.4 and 20.0 years of age with a mean of 7.4 years ($SD = 5.22$ years), an issue addressed in statistical analyses reported later. Nine of the CI users reported receiving a second implant between 7 and 17 years of age with a mean of 19.28 years ($SD = 3.24$ years). As part of this study, unaided, pure-tone air-conduction thresholds were determined for all participants, using headphones, at octaves from 250 to 4000 Hz and 6000 Hz. Testing was performed by a licensed audiologist, proficient in American Sign Language (ASL), in a double-walled sound-treated booth using a GSI 61 audiometer, GSI 1761–9635 speakers, and TDH-50P supra-aural headphones. Equipment was calibrated in compliance with American National Standards Institute (ANSI) S3.6 Specification for Audiometers. Among the CI users, unaided, four-frequency pure tone average (PTA) hearing thresholds in the better ear ranged from 79 to 125 dB with a mean of 111.07 dB ($SD = 11.92$). The unaided PTAs of the deaf students who did not use CIs ranged from 8 to 124 dB with a mean of 84.66 dB ($SD = 24.53$).

Materials and Procedure

The materials and methodology described here were approved by the Rochester Institute of Technology Institutional Review Board.

Psychosocial Measures

Participants were tested in small groups of varying size as they completed two untimed, pencil-and-paper psychosocial measures, both of which were developed for use with deaf adolescents and adults. One or two sign language interpreter(s)/research associate(s) conducted each session, communicating with the participants in their preferred modality (speech, sign,

or both). The instruments were administered during the first two months of the fall semester and again during the last two months of the spring semester. The language assessments described below were administered within days of participants' completing the psychosocial measures.

Identity

As described earlier, Maxwell-McCaw and Zea's (2011) DAS indexes both deaf and hearing cultural identity, making it an ideal instrument for use in the present study. The DAS instrument includes 58 statements that are rated by participants using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), yielding four subscales that allow identification of deaf individuals' within deaf, hearing, marginal (low on both deaf and hearing acculturation), and bicultural (high on both deaf and hearing acculturation) categories (see also Hintermair, 2008; Nikolarazi & Hadjikakou, 2006).

Quality of life

The YQoL-DHH, also described earlier, is a validated quality of life instrument designed for deaf youth ages 11–19 years (Patrick et al., 2011). It taps sense of self, social relationships, personal environment, and quality of life with subscales indicating perceived stigmatization, social participation, and self-acceptance/advocacy. The instrument includes 32 statements about how individuals feel about their lives "in general." Each is rated using a 10-point scale from 1 (not at all) to 10 (very much).

Language Measures

Because of our interest in the possibility that self-reported and actual language abilities among deaf youth might differentially affect psychosocial functioning, this investigation parted from earlier studies by assessing their spoken language and sign language skills as well as asking individuals for ratings of their abilities in each modality. The measures described here were administered as part of a larger test battery in a longitudinal project examining relations among various aspects of language, cognition, learning, and social-emotional functioning among deaf college students. Descriptions of the following assessments largely are drawn from the larger project (see Spencer et al., 2017).

Sign Language Assessment

Expressive sign language skill. The Sign Language Proficiency Interview (SLPI) is a tool for evaluating sign language skills widely used in the United States. Designed for use with deaf college students and adults, it consists of a one-to-one signed conversation between an interviewer and interviewee (<https://www.rit.edu/ntid/slpi>). Three sign language interpreters/researchers involved in this study underwent formal SLPI training explicitly for the purpose of this project. During recruitment, all participants rated their sign language skills on a six-point Likert scale corresponding to SLPI rating system descriptors ranging from 0 (e.g., "I either do not know any sign, or I know very few basic signs and have to fingerspell most of my responses to basic questions signed to me") to 5 (e.g., "I am a highly skilled signer and can easily understand someone signing to me"). Although a SLPI of level 2 appears to be the lowest at which one might be considered to know sign language (e.g., "I can discuss basic social and school topics and respond usually with 1–3 sentences"), participants who rated themselves 1 or higher were administered a SLPI.

Administration of the SLPI involved each participant engaging in a 20-min interview with the same certified, SLPI-trained interpreter. Recorded interviews subsequently were rated for

vocabulary knowledge, sign production, fluency, ASL grammatical features, and comprehension by the interviewer and the other two interpreter-researchers who had SLPI training (see Spencer et al., 2012, for details). Ratings followed the SLPI rating scale, from "No Functional Skills" to "Superior" (0 to 5) with "plus" sublevels for levels 1 through 5 (1.5, 2.5, ... 5.5). During the spring semester, all students rated themselves on the SLPI scale and again were administered SLPIs.

Receptive sign language skill. During recruitment, participants rated their perceived receptive sign language skill on a six-point Likert scale (0–5) from "no skill" to "native-like/superior." Actual sign language receptive skill was assessed by having all students who qualified for an SLPI watch ASL presentations of primary level (grades 5–6) narrative passages drawn from the *Qualitative Reading Inventory—3* (QRI, Leslie & Caldwell, 2001), a reading assessment tool for pre-primer through high school grade levels. The fall testing involved a three-minute (3:15) presentation of the QRI passage about Margaret Mead; the spring testing involved a three-minute (3:03) presentation of the passage about Pelé.² Immediately after each presentation, participants were asked to retell the story in as much detail as possible ("write down as much as you can remember") without regard to spelling or grammar. When they were finished, they were given a multiple-choice test on the content. Given the findings of Marschark et al. (2009) indicating that deaf college students' retelling of QRI passages in sign language did not result in differences from written retelling, the latter was used in this study in order to simplify scoring. Retelling of each passage was scored according to the QRI instructions, ignoring errors of spelling and grammar. The multiple-choice tests consisted of 17 questions each; each question offered four alternative responses covering the same range of information as the eight open-ended questions suggested by QRI. Retelling and multiple-choice tests yielded proportional scores that were added together to provide a composite sign language reception score for each passage.

Speech Assessment

During recruitment, participants self-rated their speech perception skill ("How well do you understand speech?") and production skill ("How well do most hearing people understand your speech?") on five-point Likert scales (1–5) from "nothing" to "everything." Individual assessments of speech production and reception were performed by a licensed audiologist as described earlier. Both assessments have been used extensively with adolescents, young adults, and older adults. These assessments were not re-tested in the spring as there was no reason to expect any changes.

Speech production. Speech production accuracy was assessed using the McGarr sentences (McGarr, 1983) to elicit speech samples from the deaf participants. Test materials consisted of 36 sentences including 12 each of 3-, 5-, and 7-syllables. Participants viewed the sentences on a monitor and read them aloud while positioned approximately 12 inches from a condenser microphone. Two independent pairs of student speech-language clinicians who were skilled in phonetics later transcribed the speech samples using broad phonemic transcription. The measure reported here is the proportion of phonemes correctly produced. Thirteen participants (two with CIs) who expressed discomfort in using their voices opted out of this assessment.

Speech recognition. Speech perception (i.e., recognition) was assessed using the Tye-Murray, Sommers, and Spehar (2007) adaptation of the open-set Iowa Sentence Test. Those recorded

stimuli consisted of 100 sentences, spoken by 10 female and 10 male adults, with vocabulary that would be familiar to children with hearing loss. Five lists of 20 sentences each were randomized across groups and conditions. Each recorded sentence was spoken by a different person and each list had a similar number of words. The test was administered in auditory, audiovisual, and visual conditions (i.e., with the speaker visible in the last two conditions); only the audiovisual and auditory conditions will be considered here. Sentences were presented at a constant 60 dB SPL for auditory and audiovisual conditions with the participant seated facing the loudspeaker. Participants viewed visual stimuli consisting of the head and neck of the test talker on a 19-inch LCD monitor approximately 32 inches from their eyes. After each sentence presentation, participants repeated it in their preferred modality (speaking, signing, or writing). Sentences were scored by the number of words in each sentence that were repeated correctly. If a participant completely missed the first ten items on any test list, testing was halted, and a score of zero was recorded.

Results and Discussion

Differences in Student Characteristics at Entry into College

This study examined relations between psychosocial functioning and language within and between groups of deaf students with and without CIs as they were entering college and possible changes in those variables (and interrelations among them) after students had completed most of their first year of study. The relevant means and standard deviations for the psychosocial and language variables at fall entry into college and at the spring follow-up are presented in Table 1. Also presented are the results of independent t-test comparisons for each variable between students with and without CIs.

Initial analyses indicated that students without CIs, as a group, scored significantly higher in their deaf acculturation than the CI users according to the DAS, but the groups did not differ in their hearing acculturation (see Table 1). Among nonusers, those who reported being native signers showed lesser hearing acculturation than those who learned to sign later, $t(23) = 3.92, p < .001$. There were no significant acculturation differences between native signers and later learners of sign language among students with CIs, all t s < 1.0 , a result that contrasts with findings by Leigh et al. (2009) with younger students. DAS categories of deaf cultural identity indicated that among the CI users, 33% scored as hearing acculturated, 21% as deaf acculturated, and 42% as bicultural. Among the nonusers, 18% scored as hearing acculturated, 25% as deaf acculturated, and 54% as bicultural.

Comparison of YQoL-DHH scores indicated no overall differences in self-acceptance/advocacy, perceptions of stigmatization, or social participation between students with and without CIs or among students who reported being native users of sign language or later learners, all t s < 1.20 . These findings suggest that either the YQoL-DHH is relatively insensitive to variability within the deaf population with regard to language and CI use, or that studies reporting improved quality of life among deaf youth who receive CIs have been remiss by failing to compare them to peers who do not use CIs (see Dammeyer, 2010; Hilton et al., 2013; Jambor & Elliot, 2005; Wheeler et al., 2007).

With regard to their sign language abilities, the CI users and nonusers did not differ significantly in the ages at which they learned to sign, their self-rated ASL expressive or receptive

skills, or their assessed ASL comprehension. Table 1 indicates that students without CIs scored significantly higher in ASL expressive skill than those with CIs, although they were not as good as they thought they were (i.e., comparing their self-rated and administered SLPI scores), $t(29) = 3.24, p < .01$.³ The CI users also overestimated their expressive sign language skills, $t(26) = 4.91, p < .001$, and did so to a somewhat greater extent than the nonusers (see Table 1). Students with CIs rated their ability to understand spoken language and produce clear speech significantly higher than did the students without CIs; the former ratings but not the latter ratings were confirmed by the audiologic assessments (see Table 1).

To summarize, although students who were not CI users, on average, scored higher in deaf cultural identity, CI users and nonusers did not differ in hearing identity or any of the YQoL-DHH quality of life indicators. The majority of CI users and nonusers were bicultural according to DAS categories, perhaps an indication of the flexibility of young adults in contemporary society (Nikolarazi & Hadjidakou, 2006). Alternatively, this may be an indicator of the kind of deaf students attracted to this unique academic environment. CI users generally demonstrated better spoken language skills than the nonusers, and the nonusers demonstrated better sign language skills than the users, but both groups tended to overestimate their abilities in those modalities.

Relations Among Student Characteristics at Entry into College

Possible relations between psychosocial and language measures at college entry were examined using correlational analyses; the results are shown in Table 2. Analyses involving DAS scores indicated that among nonusers, greater deaf acculturation was significantly associated with higher self-ratings of ASL expressive and receptive abilities and greater assessed ASL expressive skill (SLPI) as well as lower auditory speech recognition and speech intelligibility. Greater hearing acculturation was negatively related to self-ratings and assessed ASL expressive ability. Hearing acculturation was positively related to self-ratings and assessed auditory and audiovisual speech recognition and also to speech intelligibility. Individuals who had received their CIs earlier were higher in hearing acculturation (see Table 2). In short, deaf students' perceptions of their sign language and spoken language abilities strongly tracked their feelings of having deaf versus hearing cultural identities.

Analyses of YQoL-DHH scores indicated a significant positive association between ASL receptive scores and perceived stigma among the CI users: the higher their sign skills, the more they felt stigmatized by their hearing losses. Although students with CIs did not show greater identification with hearing culture than nonusers, their lesser deaf acculturation suggests that while functioning in a mainstream college environment, their sign language skills (positively related to deaf acculturation scores and negatively related to hearing acculturation scores) marked them as "different" from both deaf and hearing peers (Kersting, 1997; Punch & Hyde, 2011). As indicated in Table 2, higher self-ratings of speech intelligibility among CI users were associated with higher YQoL-DHH self-acceptance/advocacy and social participation scores, while higher self-ratings of speech recognition were associated with lower perceived stigmatization (Punch & Hyde, 2005). These findings, perhaps again reflect the importance of spoken language to CI users in mainstream academic settings (Nikolarazi & Hadjidakou, 2006; Van Gent et al., 2012).

Table 1. Means and standard deviations for first year psychosocial and language variables in fall and spring semesters and results of t-test comparisons for postsecondary students with and without cochlear implants

Variable	CI			No-CI			t	df
	M	SD	n	M	SD	n		
Psychosocial								
Fall								
YQoL Self-acceptance/Advocacy	111.70	13.03	27	111.27	21.66	30	0.09	55
YQoL Perceived Stigma	30.04	16.69	27	30.08	16.62	30	-0.01	55
YQoL Participation	50.44	16.70	27	52.67	19.45	30	-0.46	55
DAS Deaf Acculturation	3.28	0.69	25	3.69	0.79	29	-2.02*	52
DAS Hearing Acculturation	3.44	0.55	24	3.35	0.63	28	0.49	50
Spring								
YQoL Self-acceptance/Advocacy	109.85	15.78	27	107.55	21.46	30	0.46	55
YQoL Perceived Stigma	30.78	17.62	27	24.47	15.90	30	1.42	55
YQoL Participation	53.04	20.09	27	53.17	22.86	30	-0.02	55
DAS Deaf Acculturation	3.21	0.69	25	3.69	0.82	28	-2.28*	51
DAS Hearing Acculturation	3.51	0.66	25	3.40	0.76	28	0.55	51
Language								
Fall								
Age Learned to Sign	4.61	5.24	24	2.74	3.18	27	1.56	49
Self-rated Receptive Sign Skill	3.33	1.41	27	3.77	1.36	30	-1.18	55
Assessed Receptive Sign Skill	0.87	0.27	27	0.95	0.22	30	-1.24	55
Self-rated Expressive Sign Skill	3.37	1.21	27	3.83	1.23	30	-1.43	55
Assessed Expressive Sign Skill	2.35	1.39	27	3.18	1.68	30	-2.03*	55
Age of Cochlear Implantation	7.39	5.22	27					
Self-rated Speech Recognition	3.65	0.69	26	2.68	1.31	28	3.39**	52
Audiovisual Speech Recognition	70.96	32.99	27	44.74	38.82	30	2.73**	55
Audio Only Speech Recognition	54.97	36.96	27	27.12	34.80	30	2.93**	55
Self-rated Speech Intelligibility	3.48	1.19	27	2.37	1.85	30	2.68*	55
Assessed Speech Intelligibility	82.28	15.77	25	84.16	21.82	19	-0.33	42
Spring								
Self-rated Receptive Sign Skill	3.59	1.19	27	3.87	1.28	30	-0.84	55
Assessed Receptive Sign Skill	1.01	0.25	27	1.06	0.29	30	-0.66	55
Self-rated Expressive Sign Skill	3.67	1.18	27	3.93	1.17	30	-0.86	55
Assessed Expressive Sign Skill	2.80	1.22	27	3.30	1.69	30	-1.28	55
Self-rated Speech Intelligibility	3.52	0.98	27	2.43	1.96	30	2.60*	55
Self-rated Speech Recognition	2.41	0.93	27	2.00	1.94	30	1.32	55

Note: CI = cochlear implant. * $p < .05$, ** $p < .01$.

Correlational analyses parallel to those of the CI users were performed for the students who were not CI users (see Table 2). Results indicated that greater deaf acculturation was associated with learning to sign earlier, greater self-rated ASL expressive and receptive abilities and greater assessed ASL production skill. Greater deaf acculturation was negatively related to self-ratings of expressive and receptive speech abilities and to measured speech intelligibility. Conversely, greater hearing acculturation was associated with lower self-ratings of ASL expressive and receptive skills as well as lower measured ASL production skill, higher self-ratings of expressive and receptive speech abilities, and higher auditory and audiovisual speech recognition. The YQoL-DHH scales were not significantly related to any of the language variables for the students without CIs. That result contrasts with claims that sign language is an important, perhaps essential component of identity and quality of life for deaf individuals, at least for those who do not use CIs (e.g., Lane et al., 1996; Oliva et al., 2016). The Kushalnagar et al. (2011) study yielded similar findings, consistent with studies indicating that many deaf individuals prefer to use spoken language and do not see it as impairing the quality of their lives (e.g., Nikolarazi & Hadjikakou, 2006; O'Neill, Arendt, & Marschark, 2014).

Because of interrelations within and between deaf students' signed and spoken language abilities and the possibility of Type I errors among the correlations, a final set of analyses examined possible language predictors of psychosocial functioning using stepwise multiple regressions in which DAS and YQoL-DHH scores alternately served as criterion variables and all of the language measures as predictor variables. Analyses involving the DAS indicated that, overall, when the various language measures and PTAs were held constant, the only significant predictor of deaf acculturation at college entry was students' ASL receptive skill, $R^2 = .65$, $\beta = .81$. Hearing acculturation at college entry was predicted only by better self-rated speech intelligibility, $R^2 = .37$, $\beta = .61$. Similar analyses utilizing the three YQoL-DHH scores as criterion variables yielded no significant predictors of self-acceptance/advocacy, perceptions of stigma, or social participation. These analyses reinforce the earlier results indicating a lack of association between sign language and quality of life for deaf learners, at least at college entry.

It should be acknowledged again that participants in the present study may have been drawn to this academic setting at least partly for the opportunity to interact with deaf peers and have access to social, cultural, and community activities through sign language (Kunnen, 2014). It therefore may not be

Table 2. Correlation coefficients for relations between language measures and psychosocial measures at college entry

	YQoL			DAS	
	Self-acceptance/Advocacy	Perceived stigma	Social participation	Deaf	Hearing
Fall					
Cochlear Implant Users					
Age Learned to Sign	-.16	-.11	.00	-.22	.12
Self-rated Receptive ASL Skill	.11	.15	-.12	.76**	-.48*
Assessed Receptive ASL Skill	-.32	.38*	.32	.25	-.19
Self-rated Expressive ASL Skill	.15	.09	-.04	.72**	-.38
Assessed Expressive ASL Skill	-.32	.14	.19	.77**	-.67**
Age of Cochlear Implantation	-.26	-.08	.04	.38	-.54**
Self-rated Speech Recognition	.30	-.39*	-.36	-.10	.42*
Audiovisual Speech Recognition	.20	-.17	-.20	-.38	.46*
Audio Only Speech Recognition	.21	-.07	-.22	-.47*	.48*
Self-rated Speech Intelligibility	.45*	-.24	-.40*	-.32	.53**
Assessed Speech Intelligibility	.19	.18	-.13	-.51*	.55**
Cochlear Implant Nonusers					
Age Learned to Sign	-.05	-.13	.13	-.48*	.39
Self-rated Receptive ASL Skill	.20	-.03	-.15	.85**	-.40*
Assessed Receptive ASL Skill	-.26	-.02	-.10	.15	-.51**
Self-Rated Expressive ASL Skill	-.03	-.02	-.03	.66**	-.35
Assessed Expressive ASL Skill	.13	-.06	-.25	.76**	-.55**
Self-rated Speech Recognition	-.13	-.13	.05	-.63**	.50**
Audiovisual Speech Recognition	-.08	-.30	-.04	-.67**	.44*
Audio Only Speech Recognition	-.03	-.31	.00	-.69**	.42*
Assessed Speech Intelligibility	-.24	.05	.19	-.48*	.10
Self-rated Speech Intelligibility	-.07	-.10	.06	-.61**	.68**
Spring					
Cochlear Implant Users					
Age Learned to Sign	.16	-.14	-.22	-.44*	.25
Self-rated Receptive ASL Skill	-.12	-.09	-.09	.64**	-.49*
Assessed Receptive ASL Skill	-.29	-.09	.16	.32	-.48*
Self-rated Expressive ASL Skill	-.06	-.05	-.16	.69**	-.54**
Assessed Expressive ASL Skill	-.04	.05	-.18	.67**	-.67**
Age of Cochlear Implantation	-.23	.13	.09	.31	-.49*
Self-rated Speech Recognition	.31	-.23	-.33	-.14	.44*
Audiovisual Speech Recognition	.13	-.22	-.25	-.31	.50*
Audio Only Speech Recognition	.15	-.15	-.20	-.44*	.64**
Assessed Speech Intelligibility	.03	.08	-.03	-.25	.61**
Self-rated Speech Intelligibility	.36	-.35	-.35	-.38	.59**
Cochlear Implant Nonusers					
Age Learned to Sign	-.04	-.04	-.05	-.63**	.46*
Self-rated Receptive ASL Skill	.29	-.10	-.18	.72**	-.45*
Assessed Receptive ASL Skill	-.11	-.03	-.26	.31	-.33
Self-rated Expressive ASL Skill	.07	.03	-.10	.74**	-.67**
Assessed Expressive ASL Skill	.18	-.04	-.13	.71**	-.59**
Self-rated Speech Recognition	.05	-.20	-.18	-.62**	.72**
Audiovisual Speech Recognition	-.17	-.21	-.18	-.62**	.53**
Audio Only Speech Recognition	-.14	-.32	-.20	-.61**	.43*
Assessed Speech Intelligibility	-.31	-.05	.16	-.44	.06
Self-rated Speech Intelligibility	.04	-.15	-.13	-.57**	.72**

Note: * $p < .05$, ** $p < .01$.

surprising that students who rely on sign language would tend toward deaf acculturation to a greater extent than their peers with CIs who use spoken language. The finding that the latter group did not demonstrate greater hearing acculturation, however, contrasts with the frequent expectation that deaf individuals who use CIs and spoken language will assimilate in the hearing world to a greater extent than individuals without CIs and who depend primarily on sign language. That expectation is not supported by available evidence involving children, and

the present findings suggest that long-term use of CIs alone is insufficient to draw deaf individuals to hearing cultural identities, at least by college age. While hearing acculturation did not differ between CI users and deaf nonusers, students with CIs identified significantly less with Deaf culture than other deaf students. This suggests that at college entry, deaf students with CIs may not have strong cultural affiliations with either Deaf or hearing cultures. However, the [Spencer et al. \(2012\)](#) finding that CI users who used both spoken and sign language during their

school years tended toward bicultural identities indicates the complexity of interactions among audiologic, psychosocial, and communication variables among deaf learners (Kunnen, 2014; Marschark & Leigh, 2016).

In summary, no differences in quality of life were observed between deaf students with and without CIs. However, there was a pattern of associations between quality of life and spoken language skills among the CI users indicating that, as in studies with adolescents cited earlier, college students with CIs generally perceived spoken language skills as associated with better quality of life. This extends the Kushalnagar et al. (2011) finding that easier communication of deaf learners with their parents, approximately 95% of whom are hearing, was associated with higher quality of life and the Van Gent et al. (2012) finding that self-worth among deaf adolescents was associated with better parent-child communication. The latter study also found self-worth linked to early use of sign language, although in the present study language abilities were not related to quality of life among the students who did not use CIs. This result supports the YQoL-DHH findings of Schick et al. (2013) that communication preference did not affect quality of life. Taken together, however, the present findings suggest that links between psychosocial functioning and language abilities among deaf students may vary with their age and context (Wolters, Knoors, Cillessen, & Verhoeven, 2012). As Archbold (2015) noted, it is complicated.

Changes in Student Characteristics over the First Year of College

Psychosocial functioning

Examination of possible changes in psychosocial functioning for the students with and without CIs over their first year in college initially involved repeated-measures analyses of variance in which group (CI users, nonusers) was a between-subjects variable and time (fall semester, spring semester) was a within-subjects variable. Analyses of the DAS indicated no significant changes in either deaf acculturation or hearing acculturation over the first academic year. Using YQoL-DHH scores as dependent variables, analyses similarly indicated no significant main effects or interactions in self-acceptance/advocacy scores, perceived stigma, or social participation from fall semester to spring semester (see Table 1).

Categories of deaf cultural identity as indicated by the DAS at the spring assessment were similar to the findings at fall testing. Among the CI users, 36% scored as hearing acculturated, 24% as deaf acculturated, and 36% as bicultural, a pattern similar to that of Marschark et al. (2017) with a broader sample of deaf college students. Among the nonusers, 18% scored as hearing acculturated, 28% as deaf acculturated, and 54% as bicultural. Among the students who were CI users, two of the 24 students who completed all questions showed shifts toward greater deaf acculturation and five showed shifts toward greater hearing acculturation. Among the students who did not use CIs, three of 25 students showed shifts toward greater deaf acculturation and three toward greater hearing acculturation. These shifts appear minimal, not what would be expected by strong proponents of Deaf immersion. Investigations over longer time periods might yield greater effects, but at present there is no evidence to suggest that there would be greater movement toward one cultural affiliation or the other. The most noticeable change was that having been exposed to deaf peers, sign language, and Deaf culture, but in a mainstream academic

environment, two-thirds of the CI users shifted from hearing acculturation to bicultural.

Language

Despite limited psychosocial changes occurring during the first year of the deaf students' college education, there might have been changes in the way that the deaf students viewed their communication skills, whether or not their self-assessments were accurate. First, considering changes over time, repeated-measures analyses of variance like those described above found no significant main effects or interactions with regard to changes in how well the deaf students thought others understood their speech; the CI users consistently rated their speech as better understood than did nonusers, $F(1, 55) = 7.32, p < .01$, partial $\eta^2 = .12$ (see Table 1). CI users also rated their speech recognition skills higher than did the nonusers overall, $F(1, 52) = 6.15, p < .01$, partial $\eta^2 = .11$, although a significant interaction reflected the fact that they judged their skills slightly lower in the spring than the fall, $F(1, 55) = 6.60, p < .05$, partial $\eta^2 = .11$. The nonusers, in contrast, rated their speech recognition skills as improved slightly over the time period. These latter findings likely reflect the effects of implicit and explicit feedback from hearing peers and staff in the college environment, where communication demands frequently are greater than during the school years.

Students' ratings of their ASL expressive abilities did not change significantly from fall to spring for either group, $F(1, 55) = 2.65, N.S.$ (observed power = .36), nor did ratings of their ASL receptive abilities, $F(1, 55) = 2.98, N.S.$ (observed power = .40). Contrary to their self-assessments, re-testing of students' ASL skills in the spring indicated that their receptive skills had improved overall, leading to a main effect of time, $F(1, 55) = 27.63, p < .001$, partial $\eta^2 = .33$, but there still was not a significant difference between the two groups, $F(1, 55) = 0.98$ (observed power = .16) (see Table 1). Expressive ASL skills as assessed by the SLPI also were found to improve from fall to spring, overall, $F(1, 55) = 14.06, p < .001$, partial $\eta^2 = .20$. However, there was a significant interaction with group reflecting somewhat greater improvement in ASL skill among the CI users, $F(1, 55) = 4.80, p < .05$, partial $\eta^2 = .08$, who had started out with lower ratings of their sign language skills compared to the nonusers. As a result, the significant difference in ASL skill that was observed between the two groups at the fall testing was eliminated in the spring (neither group approached a ceiling effect). In other words, not all CI users are exclusively "oral." Deaf college students use alternative forms of communication for their own perceived social and academic purposes rather than conforming to the demands of political correctness and the expectations of others.

Relations Among Student Characteristics Following the First Year of College

As can be seen in Table 2, a correlational analysis examining relations among psychosocial and language variables at spring testing yielded the same pattern of results as at fall testing. YQoL-DHH scores were not significantly related to any of the language measures. DAS scores, however, indicated deaf acculturation to be positively correlated with self-rated and assessed expressive and receptive sign language skill and negatively correlated with expressive and receptive spoken language skills for both CI users and nonusers. Most but not all correlations were significant, but all were in the same direction as at fall testing, and self-rated skills generally were more strongly related to DAS scores than assessed skills. Similarly,

greater hearing acculturation was positively associated with better expressive and receptive spoken language skills and negatively associated with sign language skills, with most correlations statistically significant and all in the expected direction.

A final set of analyses sought to determine the extent to which the language variables predicted acculturation and quality of life at the end of the first year in college. Stepwise multiple regressions included all self-rated and measured language scores as predictor variables and used each of the psychosocial measures, in turn, as the criterion variable. These analyses indicated that, contrasting with results at the point of entering college, when other factors were held constant, the only significant predictor of deaf acculturation at spring testing was students' self-ratings of their ASL expressive ability, $R^2 = .50$, $\beta = .71$; hearing acculturation was predicted only by better self-rated speech recognition, $R^2 = .42$, $\beta = .65$. There were no significant language-related predictors of self-acceptance/advocacy, perceptions of stigma, or social participation.

Summary, Conclusions, and Limitations

The present study examined relations among psychosocial functioning (cultural identity, social participation, stigmatization, quality of life, self-advocacy/acceptance), language, and CI use among deaf students at the beginning and end of their first year in college. Foremost among the findings were consistent results contradicting any strong claims that either deaf acculturation and the use of sign language or cochlear implantation and the use of spoken language are necessarily essential to quality of life for young deaf adults. Regardless of how they arrived at this point, the two groups of students in the present study evidenced no real differences in the perceived quality of their lives. Many deaf individuals gain benefit from the use of CIs, just as many do early access to sign language. (Although, in the present study, there were no acculturation differences between CI users who were native signers and those who learned to sign later.)

The present findings emphasize that sign language and CIs need not be mutually exclusive. Neither does one language modality orientation, whether described in terms of language use or cultural identity, offer a panacea for the psychosocial challenges of hearing loss during the adolescent and young adult years. The literature reviewed earlier, together with the present findings, clearly indicate that the heterogeneity of the deaf population, variability in school placement, language fluencies, family support, and other factors are such that young deaf adults each will have to "find their own way" rather than being offered a one-size-fits-all recipe for personal, social, and academic success (Knors & Marschark, 2012).

Together with previous findings from developers of the YQoL-DHH, this study also suggests the need for further evaluation of that instrument for both methodological and theoretical reasons. Schick et al. (2013) found that controlling for other factors, none of the YQoL-DHH subscales, reportedly reflecting quality of life, differed as a function of deaf individuals' school placement, preferred communication modalities, degrees of hearing loss, or CI use, although CI users perceived lower levels of stigma than did other deaf individuals. Kushalnagar et al. (2011) found that deaf individuals who reported a preference for spoken language (which would have included many CI users) perceived greater stigma than those using both speech and sign, but there were no other significant differences as a function of language modality. In particular, there were no

differences in YQoL-DHH measures between participants who used spoken language compared to sign language. Together with the limited associations between YQoL-DHH and acculturation or language skills in the present study, such findings suggest that either the YQoL-DHH is insensitive to factors normally seen as important to deaf individuals (e.g., Holcomb, 2013; Lane et al., 1996; Oliva et al., 2016) or that those factors are not as significant for psychosocial functioning as generally has been assumed.

Given the participants' daily exposure to sign language (and Deaf culture) throughout the academic year, the lack of change in participants' sign language skills over the course of the school year also might represent a lack of sensitivity in the expressive and receptive sign language measures used here. That possibility would be consistent with the low observed power of the between-group comparisons. Insofar as the participants in this study also did not show any real changes in cultural identity, however, such findings suggest that cultural identity and language preference are fairly stable among deaf individuals of college-age, at least over the timeframe considered here (see below).

Despite many consistencies in the present findings, there are limitations to this study that raise additional questions. Most centrally, the majority of previous research concerning cultural identity, psychosocial functioning, and language among deaf learners has involved children and adolescents. The limited literature concerning deaf students of college age generally has involved asking students or adults about factors that contribute (d) to their psychosocial functioning, rather than actually measuring those outcomes. When language fluencies have been included in such investigations, they have relied almost exclusively on self-reports. As described earlier, however, several recent studies have revealed that many of those self-reports and assumptions about what factors influence psychosocial functioning among college students are not supported by more objective measures. That situation may be a reflection of general metacognitive issues found among deaf college students who are less accurate than hearing peers in assessing their abilities (e.g., Borgna, Convertino, Marschark, Morrison, & Rizzolo, 2011) or simply the fact that so few empirical studies have used other measures to validate self-reports. In any case, distinctions need to be made between evidence obtained from self-reports and more objective assessments, particularly when a population as heterogeneous as this one is considered. Both matches and mismatches from the two sources can be informative, but one should not be assumed necessarily to mirror the other (Spencer et al., 2017).

Another limitation of the present study, as noted earlier, is the relatively brief timeframe involved between first and second data collections. The primary focus of the present study was the characteristics of deaf CI users and nonusers beginning their college careers and possible changes in their psychosocial and language skills during their first year—when deaf (as well as hearing) students are most likely to drop out of their academic programs. Kersting (1997) reported that, based on interviews with several deaf students who started their college careers with limited knowledge about sign language and Deaf culture, sign language skills and social-emotional functioning improved over two or three years in the same college setting as the present study (albeit almost 20 years ago). The present findings of limited, if any, changes from college entrance to the end of the first year in psychosocial functioning or language fluencies may simply be the result of the brief period between assessments. However, the lack of change toward greater deaf acculturation

and quality of life among college deaf students with new opportunities to interact with deaf peers, staff, and teachers contradicts frequent informal claims and conference presentations based on student and staff self-reports, as well as assumptions of some educators of deaf students (e.g., Stinson & Walter, 1997). Longer-term follow-up studies clearly are needed in this regard, studies that would include both self-reports and formal assessments.

Finally, although the present study sought to evaluate relations among psychosocial functioning and language, the receptive and expressive language measures used, and the spoken language measures, in particular, were far from naturalistic. In order to understand more fully how language abilities affect various aspects of psychosocial functioning, they should be evaluated in real-world settings involving interactions with peers, parents, and significant others. Such studies have been conducted with young children in more tractable situations (e.g., parent-child play) and would be well worthwhile with older populations as well. Lacking such information, the present findings should be taken primarily as a caution against making assumptions about who deaf adolescents and young adults are based solely on their use of sign language or spoken language and whether or not they use CIs.

Notes

1. As described later, the participants in the present study had a wide range of hearing thresholds, and “deaf” is used inclusively here.
2. Although the QRI does not provide a basis to judge the relative difficulty of the Margaret Mead (fall testing) and Pelé (spring testing) passages, the former is considered “level 5” and the latter “level 6.” To all appearances, the latter is more difficult. The observed significant increase in students’ receptive ASL skills described later thus may be an underestimate.
3. Among the language measures, only self-rated and assessed expressive sign language skills are amenable to direct statistical comparison, having used the same instrument (SLPI).

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Conflicts of interest

No conflicts of interest were reported.

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