An Exploratory Study of Characteristics Associated with Postsecondary Educational Attainment in Students who are Deaf or Hard of Hearing

Amy Marie Hebert
*University of Arkansas, Fayetteville*

Follow this and additional works at: [https://scholarworks.uark.edu/etd](https://scholarworks.uark.edu/etd)

Part of the *Higher Education Commons, and the Speech and Hearing Science Commons*

Citation
Hebert, A. M. (2012). An Exploratory Study of Characteristics Associated with Postsecondary Educational Attainment in Students who are Deaf or Hard of Hearing. *Graduate Theses and Dissertations* Retrieved from [https://scholarworks.uark.edu/etd/501](https://scholarworks.uark.edu/etd/501)

This Dissertation is brought to you for free and open access by ScholarWorks@UARK. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of ScholarWorks@UARK. For more information, please contact scholar@uark.edu.
AN EXPLORATORY STUDY OF CHARACTERISTICS ASSOCIATED WITH POSTSECONDARY EDUCATIONAL ATTAINMENT IN STUDENTS WHO ARE DEAF OR HARD OF HEARING
AN EXPLORATORY STUDY OF CHARACTERISTICS ASSOCIATED
WITH POSTSECONDARY EDUCATIONAL ATTAINMENT
IN STUDENTS WHO ARE DEAF OR HARD OF HEARING

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Rehabilitation

By

Amy M. Hebert
University of Arkansas at Little Rock
Bachelor of Science in Interpreter Education, 2002
University of Arkansas
Master of Science in Rehabilitation, 2004
University of Arkansas

August 2012
University of Arkansas
ABSTRACT

It is well documented that attrition in the postsecondary settings for students who are deaf or hard of hearing is greatly due to their academic and communication skills, as well as pre-entry attributes. However there is little evidence that indicates why students who are deaf or hard of hearing are successful in the postsecondary setting. This study tested a hypothesis that demographic, family, psychological and educational variables have a relationship with postsecondary attainment. The variables included in the study were gender, race, math literacy, reading literacy, high school academic setting (public/residential), communication modality (sign language/oral speech), cochlear implant user, parental academic expectation, parental educational attainment, self-determination, self-concept, self-advocacy, and friendship interaction.

This study analyzed a sample of students utilizing existing data from the National Longitudinal Transition Study 2 (NLTS2). The findings from this study supported the hypothesis that demographic, family, psychological and educational variables highly influence postsecondary completion. The only exception was no significant relationship was found between cochlear implant use and high school academic placement with postsecondary attainment.

Findings from this study will help professionals to bridge the gap from research to practice. Results will directly impact how programs approach career planning and advising. Finally, the knowledge from this study will directly impact career planning and career advising as well as inform program development for retention of deaf or hard of hearing students in persistence to graduation.
This dissertation is approved for recommendation to the Graduate Council.

Dissertation Director:

_______________________________________
Dr. Glenn B. Anderson

Dissertation Committee:

_______________________________________
Dr. Steven E. Boone

_______________________________________
Dr. Richard T. Roessler

_______________________________________
Dr. Charles E. Stegman
DISSERTATION DUPLICATION RELEASE

I hereby authorize the University of Arkansas Libraries to duplicate this dissertation when needed for research and/or scholarship.

Agreed

________________________________________
Amy M. Hebert

Refused

________________________________________
Amy M. Hebert
ACKNOWLEDGEMENTS

I would like to thank the University of Arkansas at Fayetteville for providing me with the opportunity to pursue my doctoral degree through the RHAB program. I would like to specifically thank Dr. Brent Williams, Dr. Judith Robertson, Dr. Ronna Turner and Dr. Gary Ritter for your thought provoking lectures. In addition, I would like to thank the members of my doctoral committee for your support, feedback and encouragement throughout the dissertation process, Dr. Glenn Anderson, Dr. Steven Boone, Dr. Charles Stegman and Dr. Rick Roessler.

I would also like to thank my family who supported me during my academic journey. First, I would like to thank my Aunt Augustine who was the first to encourage me to seek higher education. Also, I would like to thank my parents for praying with me every time I wanted to give up. I appreciate the sacrifice my children made so that I could continue on education. My children were truly my inspiration to never give up.

I would not be writing this acknowledgement without the support of many, many friends. There were so many that were rooting for me, I could not possibly name them all. However, I would like to mention a few who have contributed to my success. I would like to thank Greta Palmberg for informing me about the wonderful opportunity to analyze the NLTS2 data. Without this information, this study would have never happened. I would also like to thank Rosalyn for her wonderful support, and for being a wonderful Mom to the kids when I was unable to attend their events. I would like to thanks Morris and Lana Knopf for providing me a quiet place to stay while I was writing. A special thanks goes to Jessalyn Frank for giving up her office several times for me to videoconference with my committee. Finally, I would like to thank Elise and Larry Kirkpatrick for providing me room and board while I was defending.
A special thanks goes to my best friend and colleague in the doctoral program, Linda. I would not be here today if it were not for her believing in me, editing my work, and just sharing the journey with me. The long commutes were an absolute joy because we shared so much, and I miss them tremendously. Linda is not only my best friend, but also my sister, and is forever imprinted in my heart. Thank you!

Finally, I would like to thank my partner, Elise who is an inspiration and support. When I thought it was hopeless and I would not be able to succeed, she refused to let me give up and quit. I would like to thank her for standing by me and loving me through all the times I was writing and she was taking care of everything else in life. This has definitely been a long, arduous journey, but it was worth the ride and I couldn’t think of anyone else in this entire world I’d want to continue the journey with, thank you.
DEDICATION

This dissertation is dedicated to my children, Sarah, Elizabeth, Rebekah, Katelyn, Samuel, Ryle and Bernardo. Every one of you inspired me along this journey to never give up. Always remember that education is the best gift you can give yourself!
# TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION

- Competing in a Global Economy ................................................................................. 1
- Postsecondary Attendance of Students who are Deaf or Hard of Hearing .................. 2
- Support for College Students Who Are Deaf or Hard of Hearing ............................. 5
- Theoretical Framework .................................................................................................. 8
- Statement of the Problem ............................................................................................... 10
- Research Questions ....................................................................................................... 11
- Significance of the Study ............................................................................................... 13
- Organization of Document ............................................................................................. 13
- Key Terms ..................................................................................................................... 15
- Key Abbreviations ......................................................................................................... 17

CHAPTER TWO: REVIEW OF THE LITERATURE

- Overview of the Postsecondary Setting ....................................................................... 18
- Postsecondary Attainment of College Students Who Are Deaf or Hard Of Hearing .... 20
- Demographic and Student Variables of College Graduates ....................................... 21
- Who are Deaf or Hard of Hearing .................................................................................. 21
- Race/Ethnicity ................................................................................................................. 21
- Gender ............................................................................................................................. 24
- Communication Modality .............................................................................................. 24
- Cochlear Implant User .................................................................................................... 25
- American Sign Language and Signing Systems .......................................................... 26
- Family Variables of College Graduates Who are Deaf or Hard of Hearing ............... 27
- Parental Academic Expectation ..................................................................................... 27
- Parental Educational Postsecondary Attainment ......................................................... 28
- Psychological Variables of College Graduates Who are Deaf or Hard of Hearing ...... 29
- Self-Concept ................................................................................................................... 29
- Self-Determination ........................................................................................................ 30
- Self-Advocacy ............................................................................................................... 31
- Friendship Interaction .................................................................................................... 32
- Educational Variables of College Graduates Who are Deaf or Hard of Hearing .......... 33
- Educational Attainment .................................................................................................. 33
- Math and Reading Literacy ............................................................................................. 34
- Academic Setting ............................................................................................................ 35
- Summary ......................................................................................................................... 36

CHAPTER THREE: METHODOLOGY

- Research Questions ....................................................................................................... 38
- Research Hypotheses ..................................................................................................... 39
- Research Design ............................................................................................................. 40
- Participants ...................................................................................................................... 41
- Sampling Weights and Design Effects .......................................................................... 45
- Assessments .................................................................................................................... 47
- Woodcock-Johnson III - Research Edition .................................................................... 47
- The Student Self-Concept Scale (SSCS) .................................................................... 48
- The Self-Determination Scale (SDS) ............................................................................. 49
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>List of Study Variables</td>
<td>142</td>
</tr>
<tr>
<td>Table 2</td>
<td>Cross-tabulation for Gender and Level of Degree</td>
<td>61</td>
</tr>
<tr>
<td>Table 3</td>
<td>Cross-tabulation for Race and Level of Degree</td>
<td>62</td>
</tr>
<tr>
<td>Table 4</td>
<td>Cross-tabulation for Sign Language and Level of Degree</td>
<td>64</td>
</tr>
<tr>
<td>Table 5</td>
<td>Cross-tabulation for Lip Reading and Level of Degree</td>
<td>65</td>
</tr>
<tr>
<td>Table 6</td>
<td>Cross-tabulation for Cued Speech and Level of Degree</td>
<td>66</td>
</tr>
<tr>
<td>Table 7</td>
<td>Cross-tabulation for Oral Speech and Level of Degree</td>
<td>67</td>
</tr>
<tr>
<td>Table 8</td>
<td>Cross-tabulation for Type of Sign Language Used and Level of Degree</td>
<td>68</td>
</tr>
<tr>
<td>Table 9</td>
<td>Cross-tabulation for Cochlear Implant and Level of Degree</td>
<td>69</td>
</tr>
<tr>
<td>Table 10</td>
<td>Cross-tabulation for Parental Expectation and Level of Degree</td>
<td>70</td>
</tr>
<tr>
<td>Table 11</td>
<td>Cross-tabulation for Parental Educational Attainment and Level of Degree</td>
<td>72</td>
</tr>
<tr>
<td>Table 12</td>
<td>Cross-tabulation for Spouse Educational Attainment and Level of Degree</td>
<td>74</td>
</tr>
<tr>
<td>Table 13</td>
<td>Cross-tabulation for Self-Advocacy and Level of Degree</td>
<td>76</td>
</tr>
<tr>
<td>Table 14</td>
<td>Cross-tabulation for Friendship Interaction and Level of Degree</td>
<td>78</td>
</tr>
<tr>
<td>Table 15</td>
<td>Mean and Standard Deviation for Self-Concept Level of Confidence</td>
<td>80</td>
</tr>
<tr>
<td>Table 16</td>
<td>ANOVA Table for the Relationship between Level of Confidence and Degree Type</td>
<td>80</td>
</tr>
<tr>
<td>Table 17</td>
<td>Mean and Standard Deviation for Self-Concept Level of Importance</td>
<td>81</td>
</tr>
<tr>
<td>Table 18</td>
<td>ANOVA Table for the Relationship between Level of Importance and Degree Type</td>
<td>81</td>
</tr>
</tbody>
</table>
Table 19  Mean and Standard Deviation for Self-Determination by Personal Autonomy  82
Table 20  ANOVA Table for the Relationship between SD Personal Autonomy and Degree Type  83
Table 21  Mean and Standard Deviation for SD Autonomy in Career Planning  84
Table 22  ANOVA Table for Autonomy in Career Planning by Degree Type  84
Table 23  Mean and Standard Deviation for SD Self-Realization  85
Table 24  ANOVA Table for the Relationship between SD Self-Realization and Degree Type  85
Table 25  Mean and Standard Deviation for SD Psychological Empowerment  86
Table 26  ANOVA Table for SD Psychological Empowerment by Degree Type  86
Table 27  Mean and Standard Deviation for Math Applied Problem  88
Table 28  ANOVA Summary for the Relationship between Applied Problems and Degree Type  88
Table 29  Mean and Standard Deviation for Math Calculations  89
Table 30  ANOVA Summary for the Relationship between Calculations and Degree Type  89
Table 31  Mean and Standard Deviation for Passage Comprehension  90
Table 32  ANOVA Summary for the Relationship between Passage Comprehension and Degree Type  91
Table 33  Mean and Standard Deviation for Synonym/Antonym Score  92
Table 34  ANOVA Summary for the Relationship between Synonym/Antonym Score and Degree Type 92

Table 35  Cross-tabulation for Academic Setting and Level of Degree 93

Table 35  Correlations for Psychological Variables 96
CHAPTER ONE: INTRODUCTION

Obtaining marketable postsecondary credentials is vital in today’s global economy. In a society where success is measured by occupation and income, having postsecondary credentials is the key to reaching the top. Approximately 39% of Americans have a postsecondary education (Soares, 2009). Struggling to succeed at the postsecondary level is difficult for many students and for a variety of reasons such as, but not limited to, working full time, having a low grade point average, finances and balancing home and school responsibilities (Brawer, 1996). If students without disabilities are having a difficult time obtaining postsecondary credentials, the task is even greater for students who are deaf or hard of hearing. In a recent study conducted by Wagner, Newma, Cameto, Garza, and Levine (2005), it was reported that 85% of deaf and hard of hearing students left their postsecondary program without obtaining a degree or certificate. There are numerous theories related to postsecondary departure, but few studies have analyzed characteristics of successful college graduates who are deaf or hard of hearing. Consequently, an important goal is to identify the characteristics of successful students who are deaf or hard of hearing who have obtained college degrees in order to reduce the number of college dropouts.

Failure to complete a postsecondary program could result in low-skilled adults and dislocated workers. Without obtaining marketable credentials, the transition landscape from college to employment is likely to be more difficult. Presumably, then, there is a benefit to investigating the characteristics of successful college graduates who are deaf or hard of hearing to develop resources to increase the number of graduates, so they can advance in the workforce.

This author would like to recognize that most often in literature a capital “D” is used in the word Deaf to respect the culture and community of Deaf individuals. It is most often used when referring to individuals who are primarily ASL users and deaf community members. This author is using deaf to refer to any person with a hearing loss, both signing and non-signing persons.
The need to investigate attributes that contribute to students completing a postsecondary program is based on three propositions; (a) in today’s global economy, US students already lag behind, which puts students who are deaf or hard of hearing at an even greater disadvantage (Valentine, Hirschy, Bremer, Novillo, Castellano, & Banister, 2009); (b) postsecondary attendance has increased considerably for students who are deaf or hard of hearing, however the attrition rate has also increased (Bowe, 2003; Wagner, 2005); and (c) many postsecondary leavers who are deaf or hard of hearing become dependent on government and state assistance, which sometimes creates a disincentive to pursuing and obtaining employment.

In this chapter, the three propositions recently stated are fully explored followed by a statement of the problem, the research questions, the significance of the study, and the organization of the document. Key terms and abbreviations are also listed at the conclusion of this chapter. Tinto’s (1993) model of student retention and social cognitive career theory (SCCT) are utilized as the theoretical framework. This study is exploratory in nature, looking retrospectively at a longitudinal study that was conducted from 2000 to 2010 by the National Longitudinal Transition Study 2 (NLTS2). The primary goal of this study was to select key variables through the exploratory study that would identify attributes of successful graduates who are deaf or hard of hearing. Results from this study provides empirical evidence related to the characteristics of successful college graduates and documents individual factors that are related with postsecondary attainment, thereby offering new insight to develop strategies for a more effective transition from high school to college for youth who are deaf or hard of hearing.

**Competing in a Global Economy**

Sweeping economic changes in a global landscape demand marketable postsecondary credentials and skills if workers are to compete in today’s job market. Preparing and equipping
U.S. citizens to meet these economic demands has become a priority for the Obama Administration. During his speech to the nation and Congress, President Barack Obama set a courageous goal to increase the number of college graduates by 2020. In his address he stated:

“And so tonight, I ask every American to commit to at least one year or more of higher education or career training” (Obama, 2009, p.1).

President Obama’s goal is for at least 50% of working age Americans to complete a postsecondary program by 2020. Such an ambitious goal is necessary because according to the National Center for Public Policy and Higher Education (2009), some type of postsecondary credential is required for 75% of the jobs available on the market today. However, approximately 61% of Americans in the workforce do not have postsecondary credentials (National Center for Public Policy and Higher Education, 2009). Furthermore, American postsecondary institutions are unable to produce the number of graduates needed to meet job market demands due to the increasing attrition rate. In fact, among industrialized countries, the United States ranks near the bottom in the percentage of students’ ages 25-34 years old with an associate’s degree or higher (Valentine et al., 2009).

Employment opportunities available in the United States are currently being given to credentialed immigrants, because there are not enough credentialed “native citizens” to meet the needs of the job market (Camarota, 2004). In Camarota’s report he states that while there is an increase in unemployment for native citizens, there is an equal increase in employment for immigrants. Considering the gaping disparity between the current job market needs and the lack of credentialed workers, many companies are hiring immigrants who have the necessary postsecondary credentials. The economic shift in hiring immigrant employees to meet the work force demand puts individuals who are deaf or hard of hearing at a greater disadvantage. Now,
instead of competing with applicants from their state, region, or country, they are competing with applicants from around the globe.

**Postsecondary Attendance of Students who are Deaf or Hard of Hearing**

The number of students who are deaf or hard of hearing seeking admission and being accepted at postsecondary educational institutions has rapidly increased over the last several decades (Walter & Decaro, 1986; Wagner et al., 2005). It is estimated that there are approximately 700,000 students between the ages of 18-38 years old enrolled in a postsecondary program who are either deaf or hard of hearing (Schroedel, 2006). Unfortunately, the vast majority of these students will exit the postsecondary system without obtaining a degree (Bowe, 2003; Wagner et al., 2005). While postsecondary attendance by students who are deaf or hard of hearing has considerably increased, the attrition rate has also increased, resulting in a largely unskilled population that struggles to obtain employment.

The lack of student persistence in postsecondary education has concerned many parents, researchers and practitioners. While there are many reasons attributed to the rising attrition rate, there is little empirical evidence to back up these claims. Some professionals argue that currently there are not enough specialized staff members in the postsecondary settings to meet the needs of students with a hearing loss. The trend for professionals to serve a diverse student population has resulted in professionals having some information about a variety of disability populations but not having the expertise to fully serve a unique population effectively. This shift from a specialist to a generalist practitioner has created a gap in services for students who are deaf or hard of hearing (Schroedel, Kelley, & Conway, 2002; Watson, Jennings, Tomlinson, Boone, & Anderson, 2008). In comparison, during the 1980’s, federal funds were allocated to establish vocational programs for students who are deaf at a limited number of postsecondary settings.
around the United States. Approximately 30% of students who were deaf or hard hearing who had graduated with a high school diploma from state residential schools for the deaf attended these programs (Bowe, 2003). These specialized programs were equipped with staff that was fluent in American Sign Language (ASL) who had the expertise to serve students who were deaf or hard of hearing. During this time, of the students pursuing a postsecondary degree, 70% left school without completing their program of study (Bowe, 2003). Although the attrition rate was considered high and an area of concern in the 1980s, there has been a steady increase over the last several decades. By the 1990s the attrition rate had increased to approximately 75% (Rawlings, Karchmer, DeCaro, & Allen, 1991; Stinson & Walter, 1992; U.S. Department of Education, 1999) and has continued to climb to the current attrition rate of 85% (Wagner et al., 2005).

It is apparent that the field has not made marked strides in resolving the student persistence phenomenon. Today, the majority of postsecondary institutions do not have staff with the skills, knowledge, and ability to help students who are deaf or hard of hearing overcome barriers and persist through to college completion (Schroedel, Kelley, & Conway, 2002), with the exception of Gallaudet University and NTID (The National Technical Institute for the Deaf). Both of these universities were established specifically for students who are deaf or hard of hearing and have staff who have the skills and expertise to serve this population.

**Support for College Students Who Are Deaf or Hard of Hearing**

To combat the low number of college graduates and the high number of college dropouts, many institutions have implemented retention programs with funding from both the state and federal government. There are programs that target specific populations of students such as low-income individuals, first generation college students, and individuals with disabilities. While
programs that serve individuals with disabilities include those who are deaf or hard of hearing, most often these general programs lack the staff with the expertise to target the unique needs of individuals who are deaf or hard of hearing. One federally funded program that is charged with enhancing educational opportunities for students who are deaf or hard of hearing is the Postsecondary Educational Programs Network 2 (PEPNet2 or PN2). However, PN2 is mandated to serve the professionals who work with students who are deaf or hard of hearing and cannot provide direct services to students. The goal of PN2 is to provide resources for professionals, who work with students who are deaf or hard of hearing, through professional development activities, technical assistance, and technology utilization. While PN2 is a valuable program, and is needed in the field of deafness, it cannot provide the direct transition-related activities to students that will equip them with the skills they need to persist to graduation in postsecondary settings.

Another program of support for an individual who is deaf or hard of hearing is the Office of Vocational Rehabilitation (VR). VR can supply individuals with support to attend college or job placement assistance if they qualify for services. However, with funding cuts from both the federal and state government, many states have implemented Order of Selection, whereby individuals with the most severe disabilities are served first (Hager, 2004). When states do not have the resources to provide services to every individual who applies to VR, that state might opt to implement order of selection criteria to ensure that the most severely disabled individuals are served first and the least severely served last, if at all. Each state that is under order of selection has set up priority categories under which a person with a disability would receive services. Each priority category defines the number of functional limitations and rehabilitation services needed by the individual, and each state varies on how they define each category. In many cases, Order
of Selection has negatively impacted many individuals who are deaf or hard of hearing, because they may not fall in the most significantly disabled category, which is the category most often served (Schroedel, Kelley, & Conway, 2002). While most individuals who are deaf may in fact qualify under this category, the majority of individuals who are hard of hearing may not.

There also has been a trend within the field of vocational rehabilitation to move towards generalist counselors as opposed to specialists (Watson, Jennings, Tomlinson, Boone, & Anderson, 2008). As a result generalist counselors may or may not have the skills and knowledge to serve individuals who are deaf or hard of hearing. Without the adequate level of knowledge and skills, counselors may not recognize the functional limitations individuals face due to a communication barrier, and inadvertently place them in a less severe category of disability.

Individuals who are unable to successfully find employment on their own or with the help of VR have limited options in finding support to live independently. Alternatively many individuals apply for Social Security Income (SSI) or Social Security Disability Income (SSDI), because they are unable to obtain or maintain employment. One barrier to career attainment is the disincentive to become independent of Social Security (Jenson & Silverstein, 2006). Even though Social Security income often prevents persons who are deaf or hard of hearing from rising above a social class that keeps them impoverished, many choose to live under these conditions, because of limited job opportunities (Murray, Klinger, & McKinnon, 2007), environmental and attitudinal barriers (Stinson, Scherer, & Walter, 1988), workplace discrimination (McMahon, Bowe, Chang, & Louvi, 2005), and lack of awareness, understanding, and/or education about career attainment (Schroedel, 1991, 1992). Given this fact SSI/SSDI creates a disincentive to individuals who are deaf or hard of hearing in seeking employment.
Theoretical Framework

It is well documented in the literature that higher levels of education lead to better career opportunities and higher levels of income (Schroedel, 2000; Boutin, 2008). This study analyzed the theoretical perspectives from both the development stage of career decision-making and college persistence. Career decision-making was analyzed using Lent, Brown, and Hackett’s (1994, Lent, Hackett & Brown, 1995; Lent, 2005) social cognitive career theory (SCCT), and college persistence was analyzed using Tinto’s model of student retention (1993).

The underlying theoretical framework of SCCT postulates that self-efficacy contributes to the development of personal agency motivating vocational behavior in the career decision-making process. According to SCCT, career attainment is shaped by the way in which self-efficacy, outcome expectations, and personal goals interact with personal and environmental factors. Self-efficacy is defined as “the belief in one’s capabilities to organize and execute the course of action required to manage prospective situations” (Bandura, 1995, p.2). Self-efficacy therefore is the foundation for human motivation, well-being, and personal accomplishment. Self-efficacy influences a person’s career choice, career development and career attainment. People must believe that their actions can produce the outcomes they desire or they will have little incentive to act or to persevere in the face of difficulties. Lent, Brown, and Hackett (1994, Lent, Hackett & Brown, 1995; Lent, 2005) state that self-efficacy comes from a) mastery experience, b) vicarious learning, c) verbal persuasion, and d) physiological states. It is reasonable, then, to believe that individuals who are deaf or hard of hearing who have: a) a limited repertoire of successful past performances, b) few appropriate adult models and mentors, c) an internalized societal views of person with disabilities as less capable, and d) communication anxiety will hold low self-efficacy beliefs that can depress career aspirations.
leading to low academic and career attainment.

Persistence is when students continue in their postsecondary programs until they graduate with a certificate or degree (Tinto, 1987). While SCCT purports that self-efficacy, along with outcome expectations and personal goals, lead to success, Tinto’s theory states that being involved in the classroom during the first year of a student’s postsecondary program leads to retention (Tinto, 2006). Tinto purports that students who develop formal and informal academic and social systems are more successful in the postsecondary setting. Formal academic systems refer to academic performance and informal academic systems refer to faculty and staff interactions. Formal social systems refer to extracurricular activities and informal social systems refer to peer-group interactions. Robbins et al. (2004) suggest that students with higher levels of self-efficacy are more likely to persist beyond the first year of college.

It has been documented that students who are deaf or hard of hearing have low rates of persistence in the postsecondary setting (Bowen, 2003; Planty, 2009). In addition, Boutin (2008) states that persistence among students who are deaf or hard of hearing is greatly due to their academic and communication skills, as well as pre-entry attributes. SCCT and Tinto’s model of student retention provide the framework for selecting the variables analyzed in this study.

Psychological and background factors considered in SCCT include self-concept, self-efficacy, gender, race/ethnicity, and socio-economic status. Tinto’s model takes into account interactions both social and academic that students have during their postsecondary experience. Based on these factors gender, race, math literacy, reading literacy, high school academic setting (public/residential), communication modality (sign language/oral speech), cochlear implant user, parental academic expectation, parental educational attainment, self-determination, self-concept, self-advocacy, and friendship interaction were analyzed to assess the relationship these variables
have with postsecondary attainment.

**Statement of the Problem**

In 2000, Schroedel and Geyer reported the outcomes of a 15-year study on the long-term career attainments of deaf and hard of hearing college graduates and found that the majority of respondents were employed and well established on their jobs. In other words, postsecondary educational attainment leads to better employment and pay among individuals who are deaf or hard of hearing. The problem however is that attrition in the postsecondary setting has been steadily increasing over the last decade for students who are deaf or hard of hearing. Research indicates that 72% (Bowe, 2003) of students who are deaf or hard of hearing attend a postsecondary setting (technical school, 2-year or 4-year college), however, 85% of students who are deaf or hard of hearing leave the postsecondary setting without obtaining a diploma (Wagner et al., 2005). There is a body of evidence that indicates students with disabilities are not successful in the postsecondary setting, because of negative attitudes, lack of comprehensive supports, unpreparedness (Deschler, Ellis, & Lenz, 1996), and lack of adaptive skills. However there is little evidence that indicates why students who are deaf or hard of hearing are successful in the postsecondary setting.

While it is important to understand why students do not persist in the postsecondary setting, it may be more beneficial to know why students do persist through to college completion. Tinto (2006) explains this concept more clearly:

“Leaving is not the mirror image of staying. Knowing why students leave does not tell us, at least not directly, why students persist. More importantly it does not tell institutions, at least not directly, what they can do to help students stay and succeed” (p.6).

By identifying attributes of successful college graduates, these results may in fact help address
the attrition problem with new approaches to “help students stay and succeed.”

**Research Questions**

The purpose of this study is to explore the attributes of successful college graduates in a sample of students who are deaf or hard of hearing using the National Longitudinal Transition Study 2 (NLTS2) database. The independent variables being studied are gender, race, math literacy, reading literacy, high school academic setting (public/residential), communication modality (sign language/oral speech), cochlear implant user, parental academic expectation, parental educational attainment, self-determination, self-concept, self-advocacy, and friendship interaction. The dependent variable utilized in this study is postsecondary completion. Postsecondary completion is defined by the NLTS2 as a student having exited any postsecondary setting by obtaining either a degree or certificate at a vocational training facility, technical school, community college or university. More specifically, this study will collect information on the attributes of successful college graduates who are deaf or hard of hearing by employing an exploratory, retrospective study.

The following research questions are addressed:

1. What are the personal characteristics of postsecondary graduates who are deaf or hard of hearing?
   - Demographic/student variables include: gender, race, cochlear implant user, communication modality, and type of sign language used.

2. What are the family characteristics of postsecondary graduates who are deaf or hard of hearing?
   - Family variable: parental academic expectation and parental educational postsecondary attainment.
3. What are the psychological characteristics of postsecondary graduates who are deaf or hard of hearing?

- Psychological variables include: self-concept, self-determination, self-advocacy and friendship interaction

4. What are the educational setting and attainment characteristics of postsecondary graduates who are deaf or hard of hearing?

- School related variables include: math score, reading score and high school academic setting (public, private or residential)

5. Among students who are deaf or hard of hearing, what are the relationships of demographic/student, family, psychological, and school related factors to type of postsecondary completion, specifically vocational/technical certificate, 2-year degree and 4-year degree?

Based on the literature review to follow in Chapter Two, the research questions in this study hypothesize that gender, race, math literacy, reading literacy, academic setting (public/residential), communication modality (sign language/oral speech), cochlear implant user, parental academic expectation, parental educational attainment, self-determination, self-concept, self-advocacy, and friendship interaction are factors that significantly contribute to the success of college graduates who are deaf or hard of hearing. The null hypothesis is that gender, race, math literacy, reading literacy, academic setting (public/residential), communication modality (sign language/oral speech), cochlear implant user, parental academic expectation, parental educational attainment, self-determination, self-concept, self-advocacy, and friendship interaction have no relationship on the success of college graduates who are deaf or hard of hearing.
Significance of the Study

Student retention has become a high priority for many colleges, including Gallaudet University and the National Technical Institute for the Deaf. Many institutions of Higher Education have shifted their resources to address the student retention issue. In addition, several state legislators have implemented formulas based on graduation rates instead of attendance rates to push colleges to give a higher priority to postsecondary completion (Harnish, 2011). Given this shift in allocation of resources, it makes sense to identify characteristics of successful college graduates who are deaf or hard of hearing.

The focus of this study on postsecondary attainment is a result of the paucity of transition research pertaining to students who are deaf or hard of hearing (Bullis, Bull, Sendelbaugh, & Freeburg, 1987; Bullis, Freeburg, Bull, & Sendelbaugh, 1990), the employment barriers encountered by individuals who are deaf or hard of hearing (Lott, Esaterbrooks, Heller & O’Rourke, 2001; Donaldson, Helmstetter, Donalsson, & West, 1994; Emerton, Foster & Gravitz, 1996), and the high and rising incidence of students who are deaf or hard of hearing leaving the postsecondary setting without obtaining a degree (Bowe, 2003; Planty, 2009). Findings from this study will help professionals to bridge the gap from research to practice. Results will directly impact career planning and career advising as well as inform program development for retention of deaf or hard of hearing college students in persistence to graduation.

Organization of Document

This study is organized into five chapters and related appendices. In this chapter a rationale for the study and the background information was provided. Chapter Two provides a comprehensive review of the literature about postsecondary educational attainment. The methodology section is presented in Chapter Three with a detailed description of all the variables.
Chapter Four provides an analysis of the results from the statistical procedure conducted in this study. Finally, Chapter Five provides a brief summary, a discussion of the findings, and recommendations and implications for further research.
Key Terms

Definitions for key terms used in the study are as follows:

Academic Setting: Students who are deaf or hard of hearing sampled in this study attended either a residential (School for the Deaf) or mainstreamed school (public or private school).

Deaf: According to the IDEA, “Deafness is a hearing impairment that is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification.” Deaf, with a capital “D” culturally is used to indicate that person belongs to the Deaf culture and uses ASL as their primary mode of communication.

Disability: any physical or mental disorder or impairment that substantially impairs an individual from performing a “major life activity,” including the ability to work

Cochlear Implant: a surgically implanted electronic device that provides a sense of sound to a person who is profoundly deaf or severely hard of hearing.

Communication Modality: The modes in which youth who are deaf or hard of hearing may communicate through. NLTS2 uses the variables; sign language, lip reading, cued speech, oral speech, communication board or book, or something else.

Educational Attainment: refers to the highest level of schooling a person has completed. In the postsecondary setting it refers to certificates, degrees and diplomas granted.

Hard of Hearing: IDEA classifies individuals who are Hard of Hearing as Hearing Impaired and according to the IDEA, “an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance.” Hard of Hearing is also used culturally to indicate a non-ASL user or someone who is not part of the deaf culture.

Hearing Impairment: According to the IDEA, “An impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance.”

Self-Advocacy: “Knowing and standing up for one’s rights, communicating effectively and assertively, and being an effective leader or team member” (Fields et al., 1998)

Self-Concept: “A complex, interactive network of self perceptions a person holds about his or her confidence in enacting certain behaviors and in having certain culturally valued personal attributes” (Gresham, 1995)

Self-Determination: "Acting as the primary causal agent in one's life and making choices and
decisions regarding one's quality of life free from undue external influence or interference" (Wehmeyer, 1992a)

**Sign Language Mode:** Type of sign language the youth uses or is learning to use, American Sign Language (ASL), Sign English or some other sign language system.
Key Abbreviations

ADA - Americans with Disabilities Act
ASL - American Sign Language
IDEA - Individual with Disabilities Education Act
LEA - Local Education Agencies
NELS - National Educational Longitudinal Study 1988-2000
NLTS2 - National Longitudinal Transition Study 2
NTID - National Technical Institute for the Deaf
OSEP - Office of Special Education Programs
PEPNet 2 - Postsecondary Educational Programs Network 2
RIT - Rochester Institute of Technology
SDS - Self-Determination Scale
SIBR - Scale of Independent Behavior Revised
SEM - Structural Equation Modeling
SES - Socio-Economic Status
SSCS - Student Self-Concept Scale
VR - Vocational Rehabilitation
CHAPTER TWO: REVIEW OF THE LITERATURE

The purpose of this chapter is to review the literature related to postsecondary attainment and the related variables in this study. The structure of this chapter includes seven headings for organizational purposes. These are (a) an overview of the postsecondary setting in the United States, (b) postsecondary attainment of college students who are deaf or hard of hearing, (c) demographic and student variables of college graduates who are deaf or hard of hearing, (d) family variables of college graduates who are deaf or hard of hearing, (e) psychological variables of college graduates who are deaf or hard of hearing, (f) educational variables of college graduates who are deaf or hard of hearing, and (g) the summary.

A systematic review of the literature was conducted using EBSCO [databases included Academic Search Premier, CINAHL, ERIC, MAS Ultra - School Edition, MLA Directory of Periodicals, MLA International Bibliography, MasterFILE Premier, Primary Search, Professional Development Collection, PsycINFO, PsycArticles, Vocational and Career Collection, TOPICsearch, Library, Information Science & Technology Abstracts]. In addition, a thorough search was conducted of published dissertations, Google Scholar and the World Wide Web. The keywords used to search were educational attainment and persistence, college completion, postsecondary graduation, psychological constructs (self-concept, self-esteem and self-advocacy), friendship, disability, Deaf, hard of hearing, and hearing impaired. Only articles written from peer-reviewed journals, 2000 until present, were included in the exhaustive review. After performing the initial review of literature, it was deemed necessary to include journals that were written before the year 2000 for two reasons; to document a) the nature of the higher education environment and how its landscape has changed over the last several decades, and b) the paucity
of research on the topic of individuals with disabilities, and particularly for those who are deaf or hard of hearing.

**Overview of the Postsecondary Setting**

In the age of a digital revolution, sweeping economic changes have made an impact on education and employment. With rapid development and improvements in technology, the skills required for many jobs available were not in existence ten years ago. Therefore, obtaining a postsecondary certificate or degree is critical to gainful employment in today’s job market. Furthermore, by 2014, 75% of the jobs available in the United States will require some type of postsecondary certificate or degree (Soares, 2009). Obtaining the credentials needed to compete for employment opportunities, maintain employment, or achieve upward mobility has been a challenge for many individuals. While postsecondary education has become more accessible to all individuals with or without a disability, because of the open enrollment criteria at many community colleges (Mortenson, 2005) and the accessibility of online courses (Carr, 2000; Terry, 2001), a significant number of students still struggle to persist through to graduation.

The reasons students do not succeed in the postsecondary setting have been well documented in the literature. These reasons include academic performance in high school, ACT and SAT scores, academic performance during the beginning of their college years, race/ethnicity, gender, socio-economic status, locus of control, self-concept, and baccalaureate aspiration (Wang, 2009). However, few studies have analyzed factors that contribute to student success (Tinto, 1993). This literature review focuses on research related to successful outcomes of postsecondary graduates who are deaf or hard of hearing. Studies that have analyzed characteristics of successful college graduates who are deaf or hard of hearing have primarily
been quantitative ethnographic or case studies. Variables identified during this literature review as having a relationship to postsecondary outcomes include:

a. Demographic/student variables: race/ethnicity, gender, cochlear implant user, communication modality, and type of sign language used.

b. Family variables: parental academic expectation and parental educational postsecondary attainment.

c. Psychological variables: self-concept, self-determination, self-advocacy and friendship interaction

d. Educational variables: educational attainment, math score, reading score and high school academic setting (public, private or residential)

**Postsecondary Attainment of College Students Who Are Deaf or Hard Of Hearing**

Navigating the college landscape is a challenge for both students with and without disabilities. While we do have some insight about postsecondary success of students without disabilities far less is known about factors that contribute to postsecondary completion than about the barriers that are experienced by students who are deaf or hard or hearing (Lang, 2002). There is an increase in the number of students who are deaf or hard of hearing being admitted to and attending a postsecondary setting (Walter & Decaro, 1986; Planty, 2009; Newman, Wagner, Cameto, Knokey, & Shaver, 2010). While the National Center for Education Statistics (1999) estimates approximately 25,000 students with a hearing loss enrolled in higher education, Schroedel (2006) found that there are approximately 700,000 students between the ages of 18-38 enrolled in higher education. One explanation for the disparity between the estimates was highlighted in Schroedel’s report, where he explains that many students with a hearing loss are
not identified because they do not seek services from Disability Support Services, and therefore are not counted in statistical reports.

This section of the literature review includes background and historical information to provide a context for the current day issues and problems that students who are deaf and hard of hearing face in the postsecondary setting. It is important to note that there are mainly two competing approaches to educating children who are deaf or hard of hearing, a manual approach and an oral approach. Given the strong philosophical differences among deaf educators, too little collaboration has occurred to leverage resources and implement programs that will address areas of need. Studies that include the population of college graduates with a hearing loss are rare.

**Demographic and Student Variables of College Graduates Who are Deaf or Hard of Hearing**

Students who are deaf or hard of hearing are a very heterogeneous group in terms of background, hearing loss and communication mode. This population ranges from individuals who view themselves as Deaf community members, have a strong cultural base rich with language (ASL), a large peer group (the residential school for the Deaf), and a shared history. On the opposite end of the spectrum is the individual who uses speech to communicate, identifies with the hearing culture, and attends schools with typical hearing youth. Research on subgroups within this population is more typical, but in general the amount of research on outcomes among the population of college graduates who are deaf or hard of hearing is rather insignificant.

**Race/Ethnicity**

The United State’s geographical landscape has shifted over the last several decades to a more diversified fabric. How the United States population has shifted and evolved is imperative to understanding the needs of college students in the United States today. Many college
campuses have also transformed into a more diverse student population, not only in terms of ethnicity, but diversity related to socio-economic status, gender, language, age and disability. When analyzing disability by ethnicity, African Americans (20.5%) have the highest prevalence rate of disability, followed by Caucasians (19.7%), Hispanic (13.1%), and Asians (12.4%) that have the least rate of prevalence of disability (U.S. Census Bureau, 2005). The NLTS2 study reported the postsecondary enrollment of students with disabilities by race/ethnicity as follows: 45.9% Caucasian, 45.2% African American, and 39.3% Hispanic (Newman, Wagner, Cameto, & Knokey, 2009).

The impact of race and ethnicity with individuals who are deaf or hard of hearing has been studied over the last several decades, but studies related to postsecondary attainment and race is naught. An emphasis on cultural identity within the Deaf community has been reported as experiences similar to other minority groups (Rittenhouse, Johnson, Overton, Freeman, and Jaussi, 1992; Parasuis, 1997). In addition, it has been reported that African American deaf people experience discrimination from both Caucasian deaf people and African American hearing people (Cohen, Fischgrund, and Redding, 1990). Furthermore, Holt and Allen (1998) report that deaf minorities are more likely to be placed in a lower level class in secondary programs than Caucasian deaf students.

In a dissertation study of African American deaf and hard of hearing students, Williamson (2004, p.vi) reports “that more than twice the number of Caucasian deaf or hard of hearing students enter and complete college with a bachelor’s degree, than African American deaf or hard of hearing.” This qualitative case study revealed that the main predictive factor of success for African American deaf and hard of hearing students was parental influence. Williamson suggests that school, family and community protective factors, foster resilience in
African American deaf and hard of hearing youth. Protective factors in Williamson’s model include caring and supportive relationships, acceptance of African American culture, acceptance of Deaf culture, open and ongoing communication, parent involvement, high expectations and positive reinforcement, challenging educational experiences, meaningful participation, spirituality and structure, and discipline.

First-generation deaf Latino students were examined by Torres (2011) to compare their literary experiences to first-generation hearing Latino students. Torres interviewed six deaf Latino graduates and five deaf Latino non-graduates. The results of this qualitative study revealed that the experiences of first-generation, deaf Latino graduates were different from first-generation Latino students who did not graduate. However, first-generation, deaf Latino graduates had similar experiences to first-generation, hearing Latino graduates in relation to preparing for college, school interactions, linguistic environment at home and parent’s level of education. In addition, this study identified students who took advantage of support services, established goals, had strong expectation of higher education, and were more assertive and independent as having greater academic success than students who do not possess these characteristics.

The shift in postsecondary enrollment for minority populations has been increasing. The largest enrollment increase has been by Hispanic students. The shift in racial/ethnic populations demand that we view postsecondary education strategies through a cultural lens to improve postsecondary outcomes among minority students. It is important to explore whether this shift in diversity is also prevalent within the population of students who are deaf or hard of hearing.
Gender

According to the U.S. Census Bureau of 2005 the demographic information by gender reports that the prevalence of disability among females (20.1%) is higher than males (17.3%). It is well documented that females outnumber males in enrolling and participating in higher education within the general population. However, only one study was found that documented gender differences of postsecondary attainment among students who are deaf or hard of hearing.

In a national longitudinal study of college graduates with a hearing loss, Schroedel and Geyer (2000) found that graduate degrees are more likely to be obtained by women (20%) than by men (13%). This study found that men with hearing loss earned more vocational degrees (32%) than woman (23%). Given this fact there would be a benefit to investigating postsecondary attainment by degree level. Since Schroedel and Geyer’s 2000 study, community colleges have seen tremendous enrollment growth. In fact, enrollment at the community college level by gender has shown a steady increase by females. Exploring gender differences in postsecondary attainment among students who are deaf or hard of hearing would yield critical information for practitioners in the field of deaf education.

Communication Modality

The academic outcome of whether a student communicates through speech, a signed system, cued speech, American Sign Language (ASL) or uses a cochlear implant is unknown. However, the majority of students accessing services in the postsecondary setting have historically requested sign language interpreters. Disability Support Service (DSS) providers have reported an increase in the need for speech-to-text services (Walter, Brant, Chiaverina, Morrison, Nunes, Smith & Swaney, 2007). It is unclear if the need for speech-to-text services is
because more non-signing hard of hearing students are accessing DSS or because signing
students prefer this method for classes with more specialized vocabulary. The need for speech-
to-text services is most likely for both reasons stated above. However, research documents that
the majority of hard of hearing students do not request support services through disability
services (Hyde, Punch, Power, Hartley, Neale, & Brennan, 2009).

Both students who are oral and sign language users have expressed that they miss content
in the classroom even with support services (Spradbrow & Power, 2004; Marschark, Sapere,
Convention & Seewagen, 2005). In a study conducted by Spradbrow and Power (2004), non-
signing students, hard of hearing students cited that they often missed content during classroom
lectures, even though they had note-taking support. In comparison with signing university
students, they cited that even with an experienced interpreter they still received less information
than hearing students (Marschark, Sapere, Convention & Seewagen, 2005).

In another study conducted by Marschark, Convertino, Macias, Monikowsh, Sapere and
Seewagen (2007), they found that both students who used ASL and those who were oral
struggled with reading comprehension, although oral students understood questions more readily
than ASL students. It is unknown whether communication modality is a factor related to
successful college completion. This study aims to identify whether or not communication
modality does in fact have an impact on postsecondary attainment.

**Cochlear Implant User**

Cochlear implants were surgically implanted for the first time in 1950. The topic of
cochlear implants did not spawn much controversy until 1980, when the age criterion for
implantation was reduced from 18 years of age to two years of age. Since this time, many
members of the Deaf community opposed the use of cochlear implants in non-consenting
children. The majority of parents choosing cochlear implantation for their children is typically hearing and wants to raise their children in an oral approach to communication. However, some students who in fact have a cochlear implant also use sign language in the communication process.

Since cochlear implant technology is relatively new, data on postsecondary outcomes with this population do not exist. Two year olds who were implanted in the 1980s would be of college age during wave five of the NLTS2 longitudinal study. A goal of this study is to document postsecondary outcomes among students who have a cochlear implant.

**American Sign Language and Signing Systems**

American Sign Language is the language used by the American Deaf culture. It is considered a language with its own grammar and syntax. It is a visual-spatial language that uses topic-comment syntax. About ten different manual systems are commonly used in the mainstreamed setting with deaf children. Most common systems used are Signed English, Pidgin Sign English, Sign Supported Speech, Seeing Essential English (SEE1), Signing Exact English (SEE2), Linguistics of Visual English (LOVE), Conceptually Accurate Signed English (CASE), Cued Speech and the Rochester Method. This study analyzes only three types of manual communication: ASL, Signed English and “some other” sign language system. “Some other” is the variable used in the NLTS2 to describe any sign system other than ASL and Signed English.

No evidence-based studies could be found that have analyzed postsecondary attainment in relation to the type of manual communication used by students. Exploring whether there is a relationship between ASL or a particular signing method to postsecondary attainment or not is an important area of interest to educators in the field of deaf education.
Family Variables of College Graduates who are Deaf or Hard of Hearing

It is impossible to discuss factors related to student success without analyzing the influence of the family dynamic. The idea of parents having a major impact on whether their son or daughter will attend college has been researched and discussed for many years. Several studies have documented family variables such as income, SES, parental expectations and educational level of the parent as predictors of success in the postsecondary setting. According to Titus (2006), students from wealthy families are more likely to complete college within six years of study than are students from poorer families. In addition, Carter (2007) found that the lower the socio-economic status of the family the lower the educational aspirations held by college students.

Research has shown that children who are Deaf perform better academically if they have Deaf parents (Ritter-Binton & Stewart, 1992). However, the majority of children who are deaf have hearing parents. One can reasonably assume that the reason for performing better academically is mainly due to the early development of language acquired by children who are Deaf from their parents who are Deaf. However, no empirical evidence related to postsecondary attainment among Deaf graduates who have Deaf parents exists. In addition, the database used for this study did not collect information about the hearing status of parents of youth who are D/deaf or hard of hearing. Given this information, focus is placed on the family variables academic expectation and parent’s highest education level attained.

Parental Academic Expectation

When analyzing parents’ perspectives with deaf children, it is important to examine parental academic expectation from two distinct perspectives, (a) Deaf children of Deaf parents, and (b) deaf children of hearing parents. Research has shown that hearing parents tend to have
lower expectations of their children who are deaf than Deaf parents of Deaf children (Leigh, Marcus, Dobosh, & Allen, 1998). However, in a study conducted with D/deaf students at RIT, 90% of whom had hearing parents, students attributed their excellent reading and writing skills to the high expectations of their parents. They also commented that, because their parents had high expectations, their teachers had high expectations as well (Toscano, McKee, & Lepoutre, 2002). In the general population, Weinberg (2010) found that parental academic expectation was directly related to SES. The lower the income that parents had the lower educational expectations they held for their children.

**Parental Educational Postsecondary Attainment**

Research related to parental educational postsecondary attainments among students who are deaf or hard of hearing was not found. However, there have been many studies over the last several decades that have found a positive relationship between parental postsecondary attainment and predisposition to attend college within the general population (Carpenter & Fleishman, 1987; Gilmour et al., 1978; Hossler & Stage, 1987; Jackson, 1986; Manski & Wise, 1983; Solomon & Taubman, 1973; Stage & Hossler, 1989; Trent & Medsker, 1967; Tuttle, 1981; Yang, 1981). Choy (2001) confirms that the higher the postsecondary attainment of the parent the more likely the student will enroll in a postsecondary setting. Students who are the first in their family to attend college, i.e., first-generation students, have lower rates of college persistence than do students who come from a family whose parents have been to college (Cabrera et al., 1992). Cabrera et al. also found that the amount of financial aid needed and awarded had an indirect effect on student persistence. Given this information, it is hypothesized that the higher the educational attainment of the parent the more likely a student who is deaf or hard of hearing is successful in the postsecondary setting.
Psychological Variables of College Graduates who are Deaf or Hard of Hearing

The way individuals view themselves and the world around them is often filtered through a cultural lens. It is one’s culture that helps to develop values, norms and self-identity. It is important to note that many individuals who are Deaf, particularly those of Deaf parents or those who attend residential schools for the Deaf, have a strong sense of cultural affiliation within the Deaf community. Individuals who are deaf or hard of hearing and attend mainstreamed schools may have difficulty associating with any culture, because they do not really fit into the Deaf culture, nor do they fit into the hearing culture. Understanding one’s self and one’s position in the social structure is imperative to the development of social competencies that are needed to navigate life. The psychological constructs valuable to this study include self-concept, self-determination, self-advocacy and level of friendship interaction.

Self-Concept

The definition of self-concept is taken from the Student Self-Concept Scale (Gresham, Elliott, & Evans, 1993) utilized to assess self-concept in this study. Gresham et al., (1993) defines self-concept as, “a complex, interactive network of self-perceptions a person holds about his or her confidence in enacting certain behaviors and in having certain culturally valued personal attributes.” Cultural and social identity is perceived through one’s self-concept. Psychological constructs related to self-concept include self-esteem, self-efficacy and outcome expectations. The underlying theoretical framework of Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994, Lent, Hackett, & Brown, 1995; Lent, 2005) postulates that self-efficacy, outcome expectations, and personal goals contribute to the development of personal agency in the career decision-making process. Career attainment is shaped by how the variables self-efficacy, outcome expectations, and personal goals interact with personal and environmental
factors. Self-efficacy is the foundation for human motivation, well-being, and personal accomplishment. Self-efficacy influences a person’s career choice, career development and career attainment. Individuals must believe that their actions can produce the outcomes they desire or they will have little incentive to act or to persevere in the face of difficulties. Goal achievement also improves self-esteem and strengthens sense of identity.

Developing a strong sense of identity, both culturally and socially, is critical to psychosocial development. Individuals who are Deaf and have Deaf parents develop identity significantly different from those with hearing parents (Leigh et al., 1998). In fact Crowe (2003) reports that self-esteem is higher for Deaf individuals who have at least one Deaf parent than for those whose parents are hearing. This finding is consistent with Bat-Chava (1993) who also found that self-esteem was more prominent in Deaf children of Deaf parents and hearing parents, who signed, than in deaf children of non-signing hearing parents. This is not to imply that sign language is the “key” to self-esteem with children who are deaf or hard of hearing. This research only implies that children need to have language models and the overall sense of “you’re like me” to aid in developing their “Deaf” identity.

In a study by Toscano, McKee, and Lepoutre (2002), students from RIT were interviewed to investigate how they acquired high-levels of reading and writing skills. Students who had high levels of reading and writing skills saw themselves as persistent and determined, as well as having a desire to reach the top. Having such a healthy belief in oneself is also presumably a correlate of a positive self-concept.

**Self-Determination**

There is a body of evidence that indicates students are more responsible in adulthood if they have participated in activities that promote self-determination and self-direction in planning
their futures (Malian & Nevin, 2002; Price, Wolensky, & Mulligan, 2002). While the effectiveness of self-determination among students with disabilities is well documented in the literature, very little has been done to examine self-determination among students who are deaf or hard of hearing.

Self-determination is defined as “acting as the primary causal agent in one's life and making choices and decisions regarding one's quality of life free from undue external influence or interference” (Wehmeyer, 1995, p.1). A study conducted by Lipkowitz (2000) with students ages 12-21 with sensory disabilities in the NYC school system was the only empirical study that was found that analyzed self-determination with students who are deaf or hard of hearing. A significant correlation was found between self-determination and math and reading achievement among students who were Deaf or hard of hearing. Given the lack of empirical evidence related to self-determination with individuals who are deaf or hard of hearing, it is imperative to include this construct to determine its impact on postsecondary attainment.

Self-Advocacy

Self-advocacy skills are important for youth to acquire in order to participate in making decisions about their lives. Knowing what one needs and having the skills to satisfy those needs helps build confidence and self-efficacy. In a dissertation study by Getch (1997), the effectiveness of self-advocacy strategies was evaluated in a group of students who were deaf or hard of hearing. An eight-week intervention was conducted, and the results indicated a significant effect on self-efficacy skills among this group of participants.
Friendship Interaction

Research documents that postsecondary success is related to integration and social relationships established early in the academic program (Tinto, 1987). While developing relationships with faculty, staff, and peers has proven to be a challenge to students with and without disabilities, for students who are deaf or hard of hearing the challenge is even greater. Many students who are deaf or hard of hearing often feel alienated from hearing faculty and peers and struggle to develop relationships (Foster & Brown, 1989). Developing the skills to break through communication barriers is critical to increasing students’ social competence to navigate the postsecondary setting.

Social competence is largely acquired through social interaction among peers (McClellan & Katz, 2001). In addition, social competence is vital for children to acquire in order to achieve healthy social and emotional adjustment in adulthood. McClellan and Katz (2001) postulate that children who do not learn social competence at an early age are at risk for many problems in adulthood such as dropping out of school, poor job retention and poor mental health. Deaf children are often deprived of opportunities to develop social skills which many hearing children acquire through vicarious learning (Gallaudet Research Institute, 2005). With limited opportunities to develop social competencies, children who are deaf or hard of hearing are at risk for delayed emotional and social development (Suarez, 2000) and lack opportunities for peer interaction. Given this fact, it is important to analyze if there is a relationship between a student’s level of friendship interaction and postsecondary academic attainment.
Educational Variables of College Graduates who are Deaf or Hard of Hearing

In 1990 only about 50% of students who are deaf or hard of hearing high school graduates enrolled in some type of postsecondary setting. By 2005, 72% of students who are Deaf or hard of hearing high school graduates enrolled in some type of postsecondary setting (Newman, Wagner, Cameto, & Knokey, 2009; Newman, Wagner, Cameto, Knokey, & Shaver, 2010). Of students who are deaf or hard of hearing that attended a postsecondary program, 46% enroll in a 2-year or community college setting, 32% enroll in vocational, business or technical school, and only 30% enroll in a 4-year college. While more students who are deaf or hard of hearing are choosing to enroll in higher education, the majority of them do not succeed. There has been a dearth of studies related to why students are not successful. However, Stinson and Walter (1997) contend that isolation is the reason many students do not succeed:

Consideration is rarely given to the fact that the student is being deprived of access to the full spectrum of life on the college campus. Such isolation, or lack of integration into the educational community, may be an important cause of attrition among Deaf persons attending college. This point especially relates to the access students have to the social life of the institution (p. 22).

Educational Attainment

The majority of students who are deaf or hard of hearing attend a mainstreamed setting as opposed to a residential or day school for the Deaf. Accommodations, support or some type of service is provided to approximately 93 percent of students (Shaver, Newman, Huang, Yu & Knokey, 2011). While many people believe that sign language interpreters are the primary accommodation for students who are deaf or hard of hearing, Shaver et al., (2011) report that extended time of test and audiology services are provided most often. The majority of students who are deaf or hard of hearing graduate from high school and enroll in some type of
postsecondary setting, but drop out before completing their program. In their study of the NLTS2 database, Newman et al., (2009) reported that the number one reported reason students with disabilities drop out of school was to go to work or join the military, and the second most reported reason was because of low grades.

**Math and Reading Literacy**

In a study by Shaver et al., (2011), findings from the Woodcock-Johnson III Tests of Achievement (WJ III) were reported test scores on six subtests: “passage comprehension, synonyms and antonyms, mathematics calculation, applied problems, social studies, and science.” Shaver and his colleagues reported that the majority of students with a “hearing impairment” scored below youth without disabilities on all six subtests. Analyzing math literacy among students with hearing impairments, 41 percent scored above “100 (the mean of the general population of youth) on the mathematics calculation subtest” and 17 percent scored less than 70 (classified as being “very low”). Of the six subtests administered to students with a “hearing impairment,” the students scored highest on the mathematics calculation test and lowest on science and passage comprehension.

Reading literacy among students who are deaf or hard of hearing has been an overriding concern for decades. Although some deaf adults read and write as well as hearing individuals, the average deaf adult has a 4th grade reading level (Channon & Sayers, 2007; Traxler, 2000). Many students who are deaf have inconsistencies in their written language in regards to grammar and syntax (Biser, Rubel & Toscano, 2007; Channon & Sayers, 2007).

In a study conducted with students at NTID/RIT researchers found that degree completion rates were higher among students with higher reading and language skills (Cuculick & Kelly, 2003). This study also found that 86% of students graduating from a baccalaureate
program had a ninth grade reading level or higher. Furthermore, Cuculick and Kelly found a
significant relationship between the type of degree program students majored in and students’
reading level.

Toscano, McKee, and Lepoutre (2002) studied college students who demonstrated strong
reading and writing skills and investigated their social, educational and demographic
characteristics. The study included only profoundly Deaf college students at RIT who were
recommended by faculty as having reading and writing skills comparable to hearing college
students. Only 46% of the students studied considered English their first language, 23%
considered ASL their first language, and 30% considered some other language as their first
language. The majority of students attributed their reading skills to parental involvement in
education and educational decisions. Students developed basic reading and writing skills early
and as the author noted, “The students in this study read early, read well, and enjoyed their
reading experiences” (p.21).

Academic Setting

Approximately 70% of children who are deaf or hard of hearing attend public schools. Of
these about 60% are mainstreamed into the regular classroom, and about 10% are placed in
resource rooms (Gallaudet Research Institute, 2008). In many cases, the student who is deaf or
hard of hearing is the only one with a hearing loss in his or her school, and sometimes the only
one in the school district. The isolation of many students in the mainstreamed setting is
experienced as social rejection, loneliness and being caught between two worlds.

Based on an analysis of the NLTS2 data, Shaver et al., (2011) reported that 76% of
students with a “hearing impairment” attended “typical” schools, and 19% attended special
schools for children with a disability such as schools for the Deaf. The remaining 4% of students
attended a charter, magnet, or alternative school or were in the hospital or home schooled. This report also indicated a significant difference in the mode of communication used by the teacher. It was reported that 48 percent of non-vocational special education teachers used both sign and speech for communication, and only 19 percent used only sign language. Significant differences were found in regards to a student’s level of “hearing impairment” and pace of instruction. In addition, results indicated that the more profound the hearing loss, the slower the pace of instruction.

Summary

According to the Condition of Education (Aud, Hussar, Planty, Snyder, Bianco, Fox, Frohlich, Kemp, & Drake, 2010) report from the National Center for Education Statistics, postsecondary attainment leads to higher wages. In the center’s report, the authors (Aud et al., 2010) provide the following wage information for individuals with a postsecondary degree in Indicator 17:

In 2008, among young adults ages 25–34 who worked full time throughout a full year, those with a bachelor’s degree earned 28% more than young adults with an associate’s degree, 53% more than young adult high school completers, and 96% more than young adults who did not earn a high school diploma. The median of the earnings for young adults with a bachelor’s degree was $46,000; for those with an associate’s degree, $36,000; for high school completers, $30,000; and for those who did not earn a high school diploma or equivalent certificate, $23,500. In 2008, at every educational level, the median of the earnings for young adult males was higher than the median earnings for young adult females; for example, young adult males with a bachelor’s degree earned $53,000, on average, while their female counterparts earned $42,000. In the same year, the median of White young adults’ earnings was higher than that of Black and Hispanic young adults’ earnings at each educational level, except the level of master’s degree or higher, where there were no measurable differences.

Regardless of how it is stated, the bottom line is that it pays to have an education. The condition of Education report indicates that higher levels of postsecondary degrees lead to higher wages.
For the most part, this literature review has demonstrated the lack of empirical research available on successful postsecondary attainment with students who are deaf or hard of hearing. At the same time, some research with such student groups and with hearing student groups does suggest some potential correlates of postsecondary success which merit further study because it is clear that postsecondary completion is vital to obtaining higher wages in employment. Analyzing postsecondary completion by level of degree earned would provide information about the characteristics of students who persist and complete higher levels of degrees.

Students who are deaf or hard of hearing face tremendous communication barriers and are isolated from peers and postsecondary social interaction. Given this fact, it is important to explore and identify what factors contribute to postsecondary success. There have been many advances in technology that have helped to bridge the communication gap for students who are deaf or hard of hearing such as video phones, speech-to-text services, and visual/text communication devices. While such advances in technology have enhanced both social and educational experiences for students who are deaf or hard of hearing these students still struggle to persist in the postsecondary setting. The research related to factors that contribute to successful postsecondary completion with the population of students who are deaf or hard of hearing is dismal. Exploring the characteristics of and identifying the factors that contribute to postsecondary completion among students who are deaf or hard of hearing is vital to developing instructional practices and programs to help increase graduation rates.
CHAPTER THREE: METHODOLOGY

In this study, successful postsecondary completion attained by students who are deaf or hard of hearing is investigated by level of degree using data from the National Longitudinal Transition Study 2 (NLTS2). The NLTS2 is a large-scale national policy, youth-focused database. The purpose of this investigation is to perform an exploratory, retrospective study of the longitudinal effects, direct and indirect, of student characteristics on the postsecondary educational attainment of students who are deaf or hard of hearing. Youth who attended a postsecondary program and completed a degree were the focus of this study. Those who withdrew before degree completion were not included in this study. A goal of this study is to identify factors that influence postsecondary completion among this population in order to develop appropriate areas of intervention and support that may assist educators, counselors and other practitioners when serving students as they transition from high school to college.

The statistical model used in this project employed multiple methods to answer the questions in this study. IRB approval was granted from the University of Arkansas Fayetteville (See Appendix A) and from the University of Arkansas at Little Rock (See Appendix B). In addition the University of Arkansas at Little Rock requested and received the NLTS2 data from the National Center for Education Statistics and is an approved site for federal data (See Appendix C). This chapter explains the background of the National Longitudinal Transition Study 2 database, the dependent variables, and independent variables being utilized in this study. This chapter will conclude with a description of the data analysis that was employed using the NLTS2.
Research Questions

This study seeks to investigate factors that contribute to a successful postsecondary completion among students who are deaf or hard of hearing. Explanation of each variable being used can be found in Table 1 (See Appendix E). The following research questions are addressed:

1. What are the personal characteristics of postsecondary graduates who are deaf or hard of hearing?
   • Demographic/student variables: gender, race, cochlear implant user, communication modality, and type of sign language used.

2. What are the family characteristics of postsecondary graduates who are deaf or hard of hearing?
   • Family variables: parental academic expectation and parental educational postsecondary attainment.

3. What are the psychological characteristics of postsecondary graduates who are deaf or hard of hearing?
   • Psychological variables: self-concept, self-determination, self-advocacy and friendship interaction

4. What are the educational setting and attainment characteristics of postsecondary graduates who are deaf or hard of hearing?
   • Educational variables: math score, reading score and high school academic setting (public, private or residential)

5. Among students who are deaf or hard of hearing, what are the relationships of demographic/student, family, psychological, and school related factors to type of
postsecondary completion, specifically vocational/technical certificate, 2-year degree and 4-year degree?

**Research Hypotheses**

The underlying hypotheses for these research questions are:

1. Demographic and student variables (gender, race, cochlear implant user, communication modality, and type of sign language used) among students who are deaf or hard of hearing strongly influence academic postsecondary completion. The null hypothesis is that demographic and student variables (gender, race, cochlear implant user, communication modality, and type of sign language used) among students who are deaf or hard of hearing do not influence academic postsecondary completion.

2. Family variables (parental expectation and parental educational attainment) among students who are deaf or hard of hearing strongly influence academic postsecondary completion. The null hypothesis is that family variables (parental expectation and parental educational attainment) among students who are deaf or hard of hearing do not influence academic postsecondary completion.

3. Psychological variables (self-concept, self-determination, self-advocacy, and friendship interaction) among students who are deaf or hard of hearing strongly influence academic postsecondary completion. The null hypothesis is that psychological variables (self-concept, self-determination, self-advocacy, and friendship interaction) among students who are deaf or hard of hearing do not influence academic postsecondary completion.

4. Educational variables (math score, reading score and academic high school setting) among students who are deaf or hard of hearing strongly influence academic postsecondary completion. The null hypothesis is that educational variables (math score, reading score and
academic high school setting) among students who are deaf or hard of hearing do not influence academic postsecondary completion.

5. Student, family, psychological, and educational variables will have a strong relationship with postsecondary educational attainment. The null hypothesis is that student, family, psychological, and educational variables do not impact postsecondary educational attainment.

Research Design

This research utilized the NLTS2 database to investigate the research questions proposed in this study. The NLTS2 is a large-scale national policy study initially funded in 2000 by The Office of Special Education Programs (OSEP) of the U.S. Department of Education to examine characteristics, experiences and transition outcomes of students with disabilities. Areas of focus included academic performance, high school coursework, extracurricular activities, postsecondary education and training, community participation, independent living and employment. The sample in this study reflects all segments of the U.S. population, representing more than 1.8 million students with a disability (Wagner, 2003).

The goal of the NLTS2 study was to have a sample of students that would represent the population of Local Education Agencies (LEAs). Across the United States there are approximately 12,000 LEAs, so in order to increase precision of estimates, the NLTS2 LEA sample was stratified to ensure low-frequency types of LEAs were adequately represented. The stratifying variables used were region, LEA size, and LEA community wealth. The region variable captures differences among the organizations, political views and economic conditions under which the schools operate.

The regions represented four geographical areas: Northeast, Southeast, Midwest and West. The size of each LEA was sorted into four categories very large, large, medium and small.
A very large LEA had enrollments greater than 14,931 in grades 7 through 12. A large LEA had enrollments from 4,661 to 14,930 in grades 7 through 12. A medium LEA had enrollments from 1,622 to 4,660 in grades 7 through 12. A small LEA had enrollments from 11 to 1,621 in grades 7 through 12. The LEA/community wealth variable was measured using the Orshansky index to ensure the sample of students would be representative of the portion of students living below the level of poverty. The Orshansky index calculates the proportion of the student population living below the federal definition of poverty (Fisher, 1992). The variable was organized into four categories, high (0 percent to 13 percent Orshansky), Medium (14 percent to 24 percent Orshansky), Low (25 percent to 43 percent Orshansky), and very low (more than 43 percent Orshansky).

Once the LEAs were randomly stratified, a sample of 3,635 LEAs and 77 state-supported schools for the deaf and schools for the blind were invited to participate in the study. The initial sample is a random selection of approximately 12,000 students that includes approximately 1,250 students in the disability category. A smaller sample of students was selected among three low-incidence disability categories, i.e., students who are autistic (n=1,012), who have traumatic brain injuries (n=559) and who are deaf-blind (n=122). Of the initial sample surveyed, 501 school districts and 38 special schools participated, which resulted in a sample size of 11,272 students.

Students selected to participate in the sample were from all regions of the nation, including all 50 states and the District of Columbia. The sample represented urban, suburban, and rural regions, and racial/ethnicity groups were equally represented with the categories of Caucasian, African American, Hispanic, Asian/Pacific Islander, and American Indian/Alaska Native. Disability populations were equally represented in this study and were categorized as
students with a learning disability, speech impairment, mental retardation, emotional disturbance, hearing impairment, visual impairment, orthopedic impairment, other health impairment, autism, traumatic brain injury, multiple disabilities, and deaf-blindness. Gender was also equally represented with 50.8% of the sample being male, and 49.2% were female. The nationally representative sample of youth receiving special education services were between the ages of 13 and 16 years old on December 1, 2000, and were in at least 7th grade.

The data were collected over a nine-year span concluding with data collection activities in 2010. Data collection for the National Longitudinal Transition Study 2 (NLTS2) began in 2001, and is reported according to waves Wave One collected data during 2001-2002, Wave Two collected data during 2002-2004, Wave Three collected data during 2004-2006, Wave Four collected data during 2006-2008 and Wave Five collected data during 2008-2010 (Wagner, Newman, Cameto, Levine and Garza, 2006). A variety of collection strategies was used during this study throughout waves one through five. Parent interviews were conducted during all wave periods. Student interviews and assessments were gathered during waves two through five. Staff interviews were conducted in waves one and two. To date all waves of the project have been completed. A projected timeline and description of the types of data collected is presented in Figure 1 below.
**Figure 1. Timeline of milestones in NTLS2**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent telephone interviews</td>
<td>*</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Youth telephone interviews</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Direct assessment/student in-person interviews</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Teacher survey</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>School program survey</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>School background survey</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Transcripts</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
<tr>
<td>Analysis</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>★</td>
</tr>
</tbody>
</table>

Reprinted with author permission (Newman, 2010; See Appendix D)
The intent of this study was to analyze waves one through five of the NLTS2. However, the first several copies of wave five that were received from NCES were corrupted and a clean copy of the data was not available at the time of this study. Therefore, only waves one, two, three and four were analyzed. This study utilized data from waves one through four of the National Longitudinal Transition Study 2 data collection: Parent interviews from waves one through four, youth telephone interviews from waves one through four, student assessments from wave one and two, school program surveys from wave one and two, and school background surveys from wave one and two. Independent variables are from waves one, two, and three of the data collection. The dependent variable, postsecondary completion, is from the fourth follow-up wave. This large-scale national policy, youth-focused database provides the unique opportunity to study how demographic, family, behavioral, psychological, and school experiences influence postsecondary educational attainment of youth with a hearing impairment.

Participants

For the purpose of this study, only participants in the NLTS2 database identified as “hearing impaired” who enrolled and completed a postsecondary program were analyzed. A postsecondary program is defined as a vocational training facility, technical school, community college or university. The NLTS2 refers to individuals who are deaf or hard of hearing as those with a “hearing impairment” so in order to provide consistency throughout this chapter, the language used to describe this population is congruous with terminology used in the national study. The NLTS2 used the definition that was described in the Individuals with Disabilities Act (IDEA) to describe the population of individuals with a disability. The definition used in the IDEA to describe individuals who are deaf or hard of hearing is:

“An hearing impairment, including deafness is an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance.
Deafness is a hearing impairment so severe that the child cannot understand what is being said even with a hearing aid” (Knoblauch, 1998).

According to the NLTS2, it is estimated that students with a hearing impairment make up 1.2% of the population, which equals a population size of 22,001 students. Students with a hearing impairment who participated in the NLTS2 study were 51.5% male and 48.5% female. For this study, students with a hearing impairment constituted a heterogeneous population that varied in communication mode, academic placement, type of hearing loss, degree of loss, and age of onset. The racial/ethnic composition was approximately 59.9% “Caucasian,” 17.5% “African American,” 17.3% “Hispanic,” 4.1% “Asian/Pacific Islander,” and 1.2% “American Indian/Alaska Native.” There were a disproportionate number of Hispanic students with a hearing impairment in comparison to Hispanic youth without disabilities (12.8%) in the general population.

**Sampling Weights and Design Effects**

The data used in the NLTS2 correspond with many different disability populations. The NLTS2 designed the samples to be used as weighted samples. Analysis weights can be used to identify group populations. A weight is added to the sample in order to adjust for the effects of non-response and is used to compensate for unequal probabilities of selection. The NLTS2 uses weights so that appropriate generalizations about the national population can be made. The purpose of the weights is so that each disability is representative of the national population. If weights were not used in a simple random sample, low-incidence populations would not be adequately represented.

Weights were calculated for each instrument used during the data collection and for each wave period. For specific analytic purposes special weights can be created. Weights should be
used when combining data from two different instruments or waves. For the purposes of this study, weights are applied to the analysis using the weight from the instrument with the lowest number of respondents, because this weight more closely approximates a special cross-instrument weight.

**Assessments**

Students in the sample received two types of assessments, a questionnaire and several direct assessments. The questionnaire that students received was administered through telephone interviews. For students with a hearing impairment the questionnaire was mailed to them and either taken individually or with a sign language interpreter. Several direct assessments were administered to students in wave one through phone or in person. Subsets of the Woodcock-Johnson III Research Edition were utilized to assess reading, math and content comprehension, the Student Self-Concept Scale (SSCS), the Self-Determination Scale (SDS), the Friendship Interaction Interview and the Scale of Independent Behavior Revised (SIBR). This study included the data collected from the reading and math subsets of the Woodcock-Johnson III, the SSCS, SDS and the Friendship Interaction Interview.

**Woodcock-Johnson III - Research Edition**

The Woodcock-Johnson Psycho-Educational Battery is used with individuals between the ages of two through ninety years old to assess cognitive and academic achievement. The research edition was created by the Woodcock-Johnson III developers for use in the NLTS2 and is a shorter version of the standard assessment. Three domains of the reading portion of the Woodcock-Johnson III were used to assess students’ synonyms, antonyms and passage comprehension. Two domains of the math portion, the applied problems subset and the calculation subset, were used to assess how students analyzed and solved problems, as well as
performed mathematical calculations. For the purpose of this study, the composite math and reading score are used as indicators of early academic performance.

**The Student Self-Concept Scale (SSCS)**

The Student Self-Concept Scale (SSCS) is a measure of self-concept that was developed by Gresham, Elliott, and Evans in 1993 and is based on self-efficacy theory and subjective task value. This seventy-two item multidimensional measure assesses both efficacy expectation and outcome expectations of children and adolescents in grades three through twelve. The SSCS has ample evidence of reliability and validity and has been nationally standardized (Gresham, 1995). The SSCS has three content domains: self-image, academic self-perception and social self-perception. Of these domains, scales are reported according to three rating dimensions: self-confidence, importance and outcome confidence. Internal consistency has been documented using Cronbach’s alpha, reliabilities ranged from .89 to .92 across all elementary and secondary students (Gresham, 1995).

The NLTS2 chose 30 items from the SSCS to include on the direct assessment given to youth. Fifteen items from the self-confidence domain and importance domain were chosen to be included in the assessment. Sample items from subscales are described in Figure 2.

**Figure 2. Sample Items from SSCS Subscales**

<table>
<thead>
<tr>
<th>Self-image</th>
<th>Academic</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am easy to like.</td>
<td>I can do my homework on time.</td>
<td>I like to be with others.</td>
</tr>
<tr>
<td>I am a nice person.</td>
<td>I can read aloud in class without feeling nervous.</td>
<td>I can control my temper in arguments with other kids.</td>
</tr>
<tr>
<td>I am proud of who am.</td>
<td>I can do my math work without help.</td>
<td>I can make friends easily.</td>
</tr>
</tbody>
</table>

The total average scale score for the SSCS is used as the subjects’ level of self-concept in this study.
Wehmeyer and colleagues (1995) constructed the Self-Determination Scale (SDS) as a self-report measure of self-determination to be used by youth with disabilities. Self-determination is defined as, “acting as the primary causal agent in one's life and making choices and decisions regarding one's quality of life free from undue external influence or interference” (Wehmeyer, 1995, p. 1). The scale is designed to assess four characteristics of self-determination: “(a) the individual acts autonomously; (b) the behaviors are self-regulated; (c) the person initiates and responds to event(s) in a “psychologically empowered” manner; and (d) the person acts in a self-realizing manner (Wehmeyer, 1995).” The scale has strong internal consistency reliability with a Chronbach alpha of .90 for the scale as a whole.

Rather than administer the scale in its entirety, the NLTS2 selected portions of the Self-Determination Scale (SDS) to administer to youth. The self-regulation subscale was not included in the direct assessment portion of the NLTS2. This section is a cognitive problem-solving approach through story telling. Only 15 out of the 32 questions on the subscale Autonomy were administered to subjects. Questions employed a four point Likert scale; 1=Not when I have the chance, 2=Sometimes, 3=Most of the time, and 4=Every time I have the chance. Sample questions included, “I keep my personal items together, I keep good personal care and grooming, I make friends with other kids my age, etc.”

The second subscale used in the NLTS2 from the SDS was the self-realization subscale. Only 5 items from this 15-item subscale were incorporated into the direct assessment. Again a four-point Likert scale was used, and response choices included; 1=Never agree, 2=Sometimes agree, 3=usually agree, and 4=Always agree. The five items included on the NLTS2 from the SDS self-realization subscale are; “I can like people even if I don’t agree with them, I know what
I do best, I like myself, I know how to make up for my limitations, and I am confident in my abilities.”

The final subscale used from the SDS was the psychological empowerment section. This domain of the scale prompts subjects to check the answer that best describes them. Six out of sixteen items were chosen to be included in the NLTS2 direct assessment. Sample questions asked the youth to choose whether, “I tell others when I have new or different opinions/ideas or I usually agree with other’s opinion/ideas; I can make my own decisions or other people make decisions for me.” The total average scale score for the SDS is used as the subjects’ level of self-determination in this study.

**Friendship Interaction Interview**

Friendship interaction was measured by including two items from the 24-item Loneliness portion of the Friendship Interaction questionnaire developed by Asher (1984). Of the 24 items on the questionnaire, 16 are questions related to loneliness and were found to be internally consistent with a Cronbach’s alpha of .90. The two items included on the NLTS2 from the loneliness domain of the Friendship Interaction interview were, “I can find a friend when I need one, and I’m lonely at school.” Responses for these two items include 1=yes, 2=no, and 3=sometimes.

**Research Variables**

**Educational Attainment Variable**

All of the variables of this study (see Table 1) were measured by information gathered from parent, youth and school questionnaires and interviews or through direct assessments. The purpose of this study is to examine which factors contribute to postsecondary completion. The variables used to verify educational postsecondary completion were taken from parent and youth
interviews in waves two, three, four and five. The variable was derived from the questions, “Youth has gotten a diploma, certificate or license from a 2-year college or university, Youth has gotten a diploma, certificate or license from a 4-year college or university, and Youth has gotten a diploma, numeric certificate or license from a postsecondary vocational or technical school.” In all three of these questions the variables use a dichotomous response of yes or no. The independent variables are presented in Table 1 (See Appendix E) along with descriptive statistics and definitions.

**Background and Student Variables**

The demographic and student variables included in this study are gender, race, cochlear implant user, communication modality, and type of sign language used. In this study gender is coded as a dichotomous variable (1=male; 2=female). Race was coded as a categorical variable (1=Caucasian; 2=African American/Black; 3=Hispanic; 4=Asian/Pacific Islander; 5=American Indian/Alaska Native; 6=Other/multiple).

Mentioned above cochlear implant user, communication modality, and type of sign language used were included to factor out whether communication modality influences postsecondary completion. The variable cochlear implant is a dichotomous variable (1=yes and 0=no). Communication modality is a categorical variable and is grouped by mode: A=sign language, B=lip reading, C=cued speech, D=oral speech, E=communication board or book, and F=something else. The variable “sign language” is further broken down into three categories; 01=American Sign Language (ASL), 02=Signed English, and 91=some other sign language system. It is important to include the variable for sign language, because it will specify if the subject has a language base, which is ASL, or uses a system of coded English.
Family Variables

Two parent variables were included in this study: parental academic expectation and parental educational attainment. For the parental academic expectation variable, the question used in the wave one parent interview was “What is the likelihood that youth will attend postsecondary school.” Respondent choices were 1=definitely will, 2=probably will, 3=probably won’t, and 4=definitely won’t. The parental education attainment variable was taken from a question in the parent interview, wave one data, that asked, “What is the highest grade [respondent, parent, or legal guardian] finished in school” respondent choices are 1=8th grade or less (includes no school); 2=9th grade or above, not a high school graduate; 3=High school graduate or GED; 4=Post high school education, no degree; 5=Vocational-technical; 6=2 year college degree/AA degree/3-year degree; 7=4 year college degree/ BA, BS degree; 8=Some post BA, BS work, no degree; 9=Master's degree, e.g., MSW, MA, MFA, MPH 10=PhD, MD, JD, LLB, or other professional; and 91=Other.

Psychological Variables

Latent variables chosen to be included in this study are self-concept, self-determination, self-advocacy, and friendship interaction. The scales used to assess these variables were described in the assessment section of this chapter with the exception of self-advocacy. A formal measurement tool was not used to assess self-advocacy, rather questions were asked in the Wave One student interview that is used to analyze self-advocacy skills among subjects.

School Variables

School variables included in this study are math score, reading score and academic setting (public, private or residential). The standard score from the Woodcock-Johnson III
(Research Edition) that subjects received on the academic knowledge portion of the synonym-antonym, comprehension, calculation and applied problems sections of the standardized assessment are used to calculate influence on education attainment.

The setting in which the subject attends school is used to assess whether academic placement influences postsecondary outcomes. When assessing youth with hearing impairments, it is important to factor out if, in fact, the environment in which learning takes place is related to educational attainment. Residential schools for the deaf provide students with a language rich environment infused with American Sign Language, whereas most students who attend a public or private school use a signed form of English or speech for academic instruction. Furthermore, students who use ASL or signed English in the mainstreamed public or private school setting can only excel academically to the level of their language role model who in most cases is an interpreter. In addition, often times students with a hearing impairment are isolated in the public or private school setting and are typically the only students in their school or district with a hearing impairment. Because of these factors it is important to analyze whether academic placement influences postsecondary achievement.

Data Analysis

The first step was to select the variables from each wave of the study, including all weights, and merge them into a new dataset. The new dataset was then filtered to only retain students who were coded as either deaf or hard of hearing, but, before the dataset could be filtered, it had to be “cleaned” to make sure no students with hearing loss were overlooked. The coding of disability status was not consistent across all waves of the study, so a new variable was created that was coded “has a hearing impairment” using 1=yes, and 0=no. For example a student may have been coded in wave one and two, but not three and four, and visa versa. In
addition, there were approximately 45 students who were coded as having a cochlear implant and also were coded as either, mild, moderate or severe to profound hearing loss, but were not coded as being deaf or hard of hearing. These students were added to the created “hearing impaired” variable. Also, there were thirty-one students who were coded with having a severe hearing loss, forty that were coded as having a moderate hearing loss, and thirty-two that were coded as having a mild hearing loss and designated sign language as being their primary mode of communication that were also added to the created “hearing impaired” variable. There were eight students coded as having a severe hearing loss and nine as having a moderate hearing loss who designated lip reading as their primary mode of communication that were added to the created “hearing impaired” variable. Finally, there were twenty-two students who indicated a mild hearing loss and designated cued speech as their primary mode of communication that were added to the created “hearing impaired” variable.

The next step was to clean up the gender variable from wave one, because there were missing data. The variables used for gender from each wave were np1A1, np2A1, np3A1 and np4A1. Missing data were checked across the four waves and then gender was designated for missing values for the gender variable np1A1.

Next the race variable was checked across all waves for missing values. The race variables used were np1A3b, np2A3b, np3A3b, and np4A3b. Values from missing data were added to the race variable np1A3b from information reported in waves two, three and four. There was a separate variable that asked if the youth was Hispanic. The Hispanic variables used were Np1A3a, np2A3a, np3A3a, and np4A3a. Missing data were checked across all waves for missing values and was combined into one variable np1A3a.
The variables used to determine if a student had a cochlear implant were np1B4e, np2B4e, np3B4e, and np4B4e, *youth has a cochlear implant*. Missing data were checked and the variable in wave one, np1B4e was retained.

The variable communication modality was coded into five different variables, *sign language, lip reading, cued speech, oral speech, communication board, and something else*. Communication modality was only collected in waves one, two, and three. Youth could select more than one mode. For the variable, *youth communicates with sign language*, the variables were np1B4g_a, np2B4g_a, np3B4g_a. These variables were combined into one variable for *sign language*, np1B4g_a.

The Communication modality variables for *youth communicates with lip reading* for waves ones, two, and three were np1B4g_b, np2B4g_b, np3B4g_b. Missing data were checked and these variables were combined into one *lip reading* variable, np1B4g_b.

The Communication modality variables for *youth communicates through cued speech* were np1B4g_c, np2B4g_c, np3B4g_c. These variables were combined into one *cued speech* variable, np1B4g_c after missing data were checked.

The Communication modality variables for *youth communicates through oral speech* were np1B4g_d, np2B4g_d, np3B4g_d. Missing data were checked and these variables were combined into one *oral speech* variable, np1B4g_d.

The Communication modality variables for *youth communicates through a communication board* were np1B4g_e, np2B4g_e, np3B4g_e. Missing data were checked and these variables were combined into one *communication board* variable, np1B4g_e.
The Communication modality variables for youth communicates through something else were np1B4g_f, np2B4g_f, np3B4g_f. Missing data were checked and these variables were combined into one communicates through something else variable, np1B4g_a.

For the variables, type of sign language used, youth were asked if they used American Sign Language (1), Signed English (2) or something else (3). The variables used were np1B4k, np2B4k, and np3B4k. Missing data were checked across all waves and on clean variable was retained for the analysis.

For the variable parental academic expectations, the responses from the variable (np1J2) youth will attend a postsecondary setting was used in the analysis. This variable had inconsistent responses reported between waves. It is likely that a parent’s expectation differed as his/her son/daughter grew older. Given this fact, only the response reported in wave one was utilized for this study; if the value was missing, then the value reported in wave two was used.

Parental educational attainment was recorded for both the reporting parent/guardian and the spouse/partner of the reporting parent. The variables used in this analysis were (np1K8) highest grade parent/guardian finished in school, and (np1K10) highest grade parent/guardian partner finished in school. When possible the responses used from wave one were the primary responses used, and responses from waves two, three and four were only used if there were missing data in wave one.

There were four psychological constructs that were analyzed in this study, self-concept, self-determination, self-advocacy, and friendship interaction. All the psychological constructs used were gathered through direct assessments administered to youth, except for self-advocacy. Self-advocacy was gathered through the parent survey as a one-item question.
Self-concept was divided into two subscales, confidence and importance. The response for each item on the subscale confidence was calculated into a scaled score, and a new variable was created SC_Conf_SS. The same procedure was used for each item on the subscale importance, and a new variable was created SC_Impor_SS.

The construct self-determination was divided into four subtests: personal autonomy, autonomy in career planning, self-realization and psychological empowerment. The response for each item was calculated into a scaled score on each subscale and a new variable was created for each category: personal autonomy (SD_PA_SS), autonomy in career planning (SD_Aut_SS), self-realization (SD_SR_SS), and psychological empowerment (SD_Emp_SS).

The construct of self-advocacy asked teachers how well youth asks for what s/he needs. This item was a survey item asked one time to teachers during wave one, and the variable used in the analysis was nxm1SelfAdvoc.

Finally, the construct of friendship asked students if they could find a friend when they needed one. This item was a direct assessment item given one time to youth during wave one, and the variable used in the analysis was ndaF1_friend.

Percentile rank and standard scores of the variables math literacy and reading literacy were collected on the Woodcock Johnson III, direct assessment. For this study the standard scores reported were used in the analysis. On the math portion of the WJIII, there were two subtests, applied problem solving (ndaAP_ss) and math calculations (ndaCalc_ss). The reading portion had two subtests as well, passage comprehension (ndaPC_ss), and synonyms/antonyms (ndaSyn_ss).

The final independent variable used in this analysis was type of school attended. It was coded into five different variables, public (nsc1A2_01), private (nsc1A2_02), residential
(nsc1A2_03), year-round (nsc1A2_04), and serves a single gender (nsc1A2_05). Missing data were checked and values were added if reported in waves two, three and four.

The dependent variable postsecondary completion was analyzed two ways. First by looking at whether a student received any type of postsecondary degree or certificate, and secondly by degree type. Postsecondary completion was gathered in waves three and four of the NLTS2. The variables used were received a diploma/certificate/license from a vocational/technical school (np4D4c2), received a diploma/certificate/license from a 2-year community college (np4D4c1), received a diploma/certificate/license from a 4-year college/university (np4D4c3), and received a diploma/certificate/license from a postsecondary institution (np4D4c1_D4c2_D4c3). Missing data were checked between wave three and four, and the cleaned variable from wave four was retained. Values reported by degree type were checked against the variable received a diploma/certificate/license from a postsecondary institution (np4D4c1_D4c2_D4c3) to ensure all values were entered.

Scale Validity

Internal consistencies for the set of items in the Student Self-Concept Scale (SSCS) and the Self-Determination Scale were analyzed. There are fifteen items that measure confidence and fifteen items that measure importance on the SCSS. The alpha coefficient for the 15 items measuring confidence is .87, and the 15 items measuring importance is .85. These coefficient scores indicate that the two subscales have high internal consistency.

The Self-Determination Scale was analyzed for internal consistency by each subscale. For the 10 items measuring personal autonomy the alpha coefficient was .76, and for the 6 items measuring psychological empowerment the alpha coefficient was .79. However, on the scales measuring autonomy in career planning and self-realization the alpha coefficients were .53
and .54. While these internal consistency for these two psychological scales were low with this sample, when analyzed with the entire sample there was high internal consistency.

Summary

This study is a retrospective, exploratory analysis designed to identify variables that are associated with postsecondary attainment among students who are deaf or hard of hearing. Based on the findings from the exploratory study, variables were selected to analyze the relationship among the dependent variable and independent variable. Student, family, psychological and school demographic variables were used to determine what impact the variables have on graduation attainment. This study employed a series of Chi-Square analysis and analysis of variance (ANOVA) to analyze differences between three groups of graduates who received a vocational certificate, 2-year degree, or 4-year degree. Chi-square analysis was used for categorical variables and ANOVAs were used for continuous variables. Finally, a post hoc pair-wise comparison was conducted between psychological variables to determine the relationship between variables.
CHAPTER FOUR: RESULTS

This chapter reports the results of an exploratory study that investigated and identified characteristics associated with postsecondary educational attainment among students who are deaf or hard of hearing. Results from this study are reported according to the research questions and hypotheses posed in Chapter three. Demographic information on each variable is reported, as well as, chi-square analysis and variable correlations. Four categories of characteristics describing the sample were analyzed to answer questions one through four. These categories included; (a) sample demography; (b) family characteristics; (c) psychological characteristics; and (d) school characteristics. In addition, results of a correlation analysis are reported to answer question five. Lastly, a summary is reported at the end of this chapter.

What are the personal characteristics of postsecondary graduates who are deaf or hard of hearing?

Hypothesis: Demographic and student variables (gender, race, cochlear implant user, communication modality, and type of sign language used) among students who are deaf or hard of hearing strongly influence academic postsecondary completion.

Sample Demography. For the purposes of this study, the demographic variables analyzed in the sample included gender, race, cochlear implant user, communication modality and type of sign language. Differences by type of degree earned were analyzed to determine if there was a significant difference between demographic variables and level of degree obtained.

A series of Chi-Square tests was used to analyze demographic variables and the type of degree students obtained. Cramer’s V was used to determine the strength of association between variables. Cramer’s V is not affected by sample size so it is appropriate to use if it is suspected that statistical significance is a result of large sample size. When analyzing a 2 X 3 matrix, it is appropriate to use Cramer’s V. A Phi Coefficient would be appropriate to use when analyzing 2 X 2 tables. The results of the Chi-Square test of independence for gender by type of degree are
reported in Table 2.

Table 2. Cross-tabulation for Gender and Level of Degree

<table>
<thead>
<tr>
<th>Gender</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>N=11,326</td>
<td>N=5,189</td>
<td>N=376</td>
<td>N=16,891</td>
</tr>
<tr>
<td></td>
<td>87.9%</td>
<td>43.9%</td>
<td>25.5%</td>
<td>64.5%</td>
</tr>
<tr>
<td>Female</td>
<td>N=1,559</td>
<td>N=6,641</td>
<td>N=1,099</td>
<td>N=9,299</td>
</tr>
<tr>
<td></td>
<td>12.1%</td>
<td>56.1%</td>
<td>74.5%</td>
<td>35.5%</td>
</tr>
<tr>
<td>Total</td>
<td>N=12,885</td>
<td>N=11,830</td>
<td>N=1,475</td>
<td>N=26,190</td>
</tr>
</tbody>
</table>

$X^2 = 6261.506$, df=2, $p<.000$  Cramer’s $V=.489$

**Gender.** A chi-square test was performed to determine gender distribution across postsecondary degree programs. This null hypothesis that gender was distributed equally was rejected with males outnumbering females overall. The cross-tabulation result for gender by degree status was statistically significant $\chi^2 (2, N = 26,190) = 6261.51, p<.000$. *Cramer’s V* was .5 which indicates a strong relationship between variables.

As reported in Table 2, the total sample was 64.5% male and 35.5% female. An analyses of gender by degree status identified large differences. Males (87.9%) are more likely to complete a postsecondary vocational degree or certificate than females (12.1%). In contrast, females (56.1%) are more likely to complete a 2-year postsecondary degree than males (43.9%). Finally, the results indicated that females (74.5%) are more likely to complete a 4-year postsecondary degree than males (25.5%). If we consider the percentage of respondents by gender, the results show that the lower the degree obtained the more likely degree completers were male, and as the level of degree increased the respondents were much more likely to be
female.

Table 3. Cross-tabulation for Race and Level of Degree

<table>
<thead>
<tr>
<th>Race</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>N=9,893</td>
<td>N=10,010</td>
<td>N=1,065</td>
<td>N=20,968</td>
</tr>
<tr>
<td></td>
<td>76.8%</td>
<td>84.6%</td>
<td>72.2%</td>
<td>80.1%</td>
</tr>
<tr>
<td>African American</td>
<td>N=355</td>
<td>N=412</td>
<td>N=292</td>
<td>N=1,059</td>
</tr>
<tr>
<td></td>
<td>2.8%</td>
<td>3.5%</td>
<td>19.8%</td>
<td>4%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>N=2,540</td>
<td>N=1,098</td>
<td>N=60</td>
<td>N=3,698</td>
</tr>
<tr>
<td></td>
<td>19.7%</td>
<td>9.3%</td>
<td>4.1%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>N=97</td>
<td>N=311</td>
<td>N=58</td>
<td>N=466</td>
</tr>
<tr>
<td></td>
<td>.8%</td>
<td>1.2%</td>
<td>.2%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Total</td>
<td>N=12,885</td>
<td>N=11,831</td>
<td>N=1,475</td>
<td>N=26,191</td>
</tr>
</tbody>
</table>

$X^2 = 1776.599$, df=6, p<.000  Cramer’s V=.184

Race. As presented in Table 3, the null hypothesis that race was equally distributed across degree programs was rejected. The total sample was 80.1% Caucasian, 4% African American, 14.1% Hispanic, 1.8% Asian/Pacific Islander, and there were no graduates of American Indian/Alaska Native or multiple ethnicities descent. The results of race by degree status was $\chi^2 (6, N = 26,191) = 1776.60$, $p<.000$. While this result is statistically significant the Cramer’s $V$ (.2) indicates little to no association between variables. However, when we look at the percentages of completers as a function of degree, we find large differences.

The results indicated that Caucasians (76.8%) are more likely to obtain a vocational certificate than African Americans (2.8%), Hispanics (19.7%) and Asian/Pacific Islanders (.8%). When we look at the percentages of completers by 2-year postsecondary degree, we find that
84.6% of Caucasians received a diploma/certificate from a 2-year community college as compared to 3.5% of African Americans, 9.3% of Hispanics, and 1.2% of Asian/Pacific Islanders. Finally, the results of completers at the 4-year postsecondary degree level were 72.2% Caucasian, 19.8% African American, 4.1% Hispanic, and .2% Asian/Pacific Islander. If we consider the percentage of respondents by race, we find that Caucasians are more likely to obtain a degree than minorities. However, when analyzing race as a function of degree by minority status we find large differences. Looking at the percentages of degree completers by minority status, we find as the level of degree increased, the percentage of African Americans degree completers increased. However, when looking at the percentage of degree completers who are Hispanic we find the opposite; as the degree level increased the percentage of Hispanic degree completers decreased.

Communication Modality. The results for communication modality by type of degree status were divided by four categories, sign language, lip reading, cued speech and oral speech. For this variable some students choose more than one category as their primary mode. For the sample overall, 81.5% of degree completers used sign language, 27.7% relied on lip reading, 17.8% used cued speech, and 95% used oral speech (see Table 4 below).
Table 4. Cross-tabulation for Sign Language and Level of Degree

<table>
<thead>
<tr>
<th>Communicates with Sign Language</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>N=941</td>
<td>N=1,858</td>
<td>N=546</td>
<td>N=3,345</td>
</tr>
<tr>
<td></td>
<td>27.3%</td>
<td>16.1%</td>
<td>37%</td>
<td>20.4%</td>
</tr>
<tr>
<td>Yes</td>
<td>N=2,505</td>
<td>N=9,648</td>
<td>N=928</td>
<td>N=13,081</td>
</tr>
<tr>
<td></td>
<td>72.7%</td>
<td>83.9%</td>
<td>63%</td>
<td>79.6%</td>
</tr>
<tr>
<td>Total</td>
<td>N=3,446</td>
<td>N=11,506</td>
<td>N=1,474</td>
<td>N=16,426</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 481.360, \text{ df}=2, p<.000 \quad \text{Cramer's} \ V = .171 \]

A chi-square test of independence was performed to determine whether the three levels of degree attainment were equally distributed by sign language. Sign language was not equally distributed by level of degree earned in the population; the result was statistically significant, \( \chi^2 (2, N = 16,426) = 481.36, p<.000 \). For this finding, Cramer’s \( V \) (.2) indicates there is little if any association between variables. As can be seen in Table 4, overall 79.6% of students use sign language as their primary mode of communication, as compared with 20.4% of students who are not sign language users. Communication modality by level of degree attained found that at the vocational/technical level 72.7% of students are sign language users, at the 2-year level 83.9% are sign language users, and at the 4-year level 63% are sign language users.
Table 5. Cross-tabulation for Lip Reading and Level of Degree

<table>
<thead>
<tr>
<th>Communicates with Lip Reading</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>N=1,675</td>
<td>N=7,746</td>
<td>N=441</td>
<td>N=9,862</td>
</tr>
<tr>
<td></td>
<td>48.6%</td>
<td>79.4%</td>
<td>29.9%</td>
<td>67.2%</td>
</tr>
<tr>
<td>Yes</td>
<td>N=1,771</td>
<td>N=2,006</td>
<td>N=1,033</td>
<td>N=4,810</td>
</tr>
<tr>
<td></td>
<td>51.4%</td>
<td>20.6%</td>
<td>70.1%</td>
<td>32.8%</td>
</tr>
<tr>
<td>Total</td>
<td>N=3,446</td>
<td>N=9,752</td>
<td>N=1,474</td>
<td>N=14,672</td>
</tr>
</tbody>
</table>

$X^2 = 2132.238$, df=2, p<.000  Cramer’s $V = .381$

The null hypothesis that lip-reading was equally distributed across degree programs was rejected. The results were statistically significant, $\chi^2 (2, N = 14,672) = 2132.24, p<.000$. Cramer’s $V$ for this finding (.4) indicated a moderate relationship between variables. Overall for the total sample 67.2% of students do not use lip reading as a means of communication. When we look at lip reading as a function of degree, students were more likely to use lip reading as a primary mode of communication at the vocational/technical level (51.4%) and 4-year degree level (70.1%). However, at the 2-year degree level only 20.6% of students indicated that they in fact use lip reading to communicate, as compared to 79.4% who do not use lip reading as a primary mode of communication.
Table 6. Cross-tabulation for Cued Speech and Level of Degree

<table>
<thead>
<tr>
<th></th>
<th>Level of Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Voc. Cert.</td>
</tr>
<tr>
<td>No</td>
<td>N=966</td>
</tr>
<tr>
<td></td>
<td>28%</td>
</tr>
<tr>
<td>Yes</td>
<td>N=2480</td>
</tr>
<tr>
<td></td>
<td>72%</td>
</tr>
<tr>
<td>Total</td>
<td>N=3,446</td>
</tr>
</tbody>
</table>

X² = 4821.720, df=2, p<.000  Cramer’s V=.575

The chi-square result for cued speech by level of degree attained was statistically significant, \( \chi^2 (2, N = 14,597) = 4821.72, p<.000 \). Cramer’s \( V \) (.5) indicated there was a strong relationship between the variables. Overall for the total sample only 26.4% of degree completers indicated they used cued speech as a means of communication; the majority of degree completers (73.6%) did not use cued speech. If we look at cued speech as a function of degree status the results indicate that 68.5% of students who are deaf or hard of hearing and graduated from a vocational/technical school used cued speech to communicate, and 31.5% indicated that they did not use cued speech as a mode of communication. When looking at cued speech users at the 2-year postsecondary degree level 89.6% of degree completers did not use cued speech as compared to 10.4% of those who did. Finally, cued speech users by 4-year postsecondary degree level 12% of degree completers used cued speech to communicate, and 88% indicated that they did not. The results tell us that cued speech users are more likely to complete vocational/technical certificates, than 2-year or 4-year postsecondary degrees.
Table 7. Cross-tabulation for Oral Speech and Level of Degree

<table>
<thead>
<tr>
<th>Communicates with Oral Speech</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>N=11</td>
<td>N=772</td>
<td>N=73</td>
<td>N=856</td>
</tr>
<tr>
<td></td>
<td>.1%</td>
<td>6.7%</td>
<td>4.9%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Yes</td>
<td>N=12,874</td>
<td>N=10,810</td>
<td>N=1,402</td>
<td>N=25,086</td>
</tr>
<tr>
<td></td>
<td>99.9%</td>
<td>93.3%</td>
<td>95.1%</td>
<td>96.7%</td>
</tr>
<tr>
<td>Total</td>
<td>N=12,885</td>
<td>N=11,582</td>
<td>N=1,475</td>
<td>N=25,942</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 841.011, \text{ df}=2, p<.000 \quad \text{Cramer's V} = .180 \]

The null hypothesis that oral speech was equally distributed across degree programs was rejected. The results were statistically significant, \( \chi^2 (2, N = 25,942) = 841.01, p<.000 \). Cramer’s \( V \) for this finding (.2) indicated little if any association between variables. Overall for the total sample the majority of degree completers (96.7%) used oral speech as a means of communication as compared to 3.3% of degree completers who did not use oral speech as a means of communication. As can be seen in Table 7, students were more likely to use oral speech as a primary mode of communication at the vocational/technical level (99.9%), the 2-year degree level (93.3%), and 4-year degree level (95.1%).
Table 8. Cross-tabulation for Type of Sign Language Used and Level of Degree

<table>
<thead>
<tr>
<th>Type of Sign Language Used</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Sign Lang.</td>
<td>N=2,328</td>
<td>N=7,467</td>
<td>N=782</td>
<td>N=10,577</td>
</tr>
<tr>
<td>Signed English</td>
<td>N=177</td>
<td>N=320</td>
<td>N=0</td>
<td>N=497</td>
</tr>
<tr>
<td>Total</td>
<td>N=2,505</td>
<td>N=7,787</td>
<td>N=782</td>
<td>N=11,074</td>
</tr>
</tbody>
</table>

\[ X^2 = 78.184, \text{ df}=2, p<.000 \quad \text{Cramer’s } V = .084 \]

**Type of Sign Language.** The results for type of sign language used by type of degree was divided into three categories, American Sign Language (ASL), Signed English, and some other type of sign used. Some other type of sign used was not calculated in the results, because there was not a sufficient sample size to include this variable. The Chi-Square test of independence for type of sign language used was statistically significant, \( \chi^2 \) (2, \( N = 11,074 \)) = 78.18, \( p<.000 \).

*Cramer’s V* for this finding (.1) indicated little if any association between variables. Overall for the total sample, 95.5% of students designated they used ASL, as compared to 4.4% Signed English users. If we look at type of sign language as a function of degree we see that degree completers were more likely to use ASL over Signed English at every degree level. At the vocational/technical level 92.9% of degree completers used ASL as compared to 7.1% of degree completers that used Signed English. Looking at the 2-year postsecondary degree level we find that 95.9% of degree completers used ASL as compared to 4.1% of Signed English users. Finally, at the 4-year postsecondary degree level we find that 100% of degree completers reported using ASL over Sign English. If we look at type of sign language across degree levels we find that as
the level of degree increased so did the percentage of ASL users. However, as the level of degree decreased the percentage of Signed English users increased.

Table 9. Cross-tabulation for Cochlear Implant and Level of Degree

<table>
<thead>
<tr>
<th>Cochlear Implant</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>N=2,122</td>
<td>N=9,540</td>
<td>N=1,373</td>
<td>N=13,035</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>98.6%</td>
<td>93.1%</td>
<td>98.2%</td>
</tr>
<tr>
<td>Yes</td>
<td>N=0</td>
<td>N=135</td>
<td>N=102</td>
<td>N=237</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>1.4%</td>
<td>6.9%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Total</td>
<td>N=2,122</td>
<td>N=9,675</td>
<td>N=1,475</td>
<td>N=13,272</td>
</tr>
</tbody>
</table>

X² = 268.278, df=2, p<.000  Cramer’s V = .142

The null hypothesis that cochlear implant user was equally distributed across degree programs was rejected. The results were statistically significant, \( \chi^2 (2, N = 13,272) = 268.28, \) \( p<.000 \). Cramer’s \( V \) for this finding (.1) indicated little if any association between variables. As can be seen in Table 9, overall of the total sample only 1.3% of degree completers had a cochlear implant. Degree completers in this study were more likely to not have a cochlear implant at the vocational/technical level (100%), the 2-year degree level (98.6%), and 4-year degree level (93.1%). However, when we look at only degree completers who do have a cochlear implant we see that as the level of degree increased the percentage of degree completers with a cochlear implant also increased.

What are the family characteristics of postsecondary graduates who are deaf or hard of hearing?

Hypothesis: Family variables (parental expectation and parental educational attainment) among students who are deaf or hard of hearing strongly influence academic postsecondary completion.
**Family Variables.** Tables 10-12 present the descriptive data regarding family characteristics. The results showed that the majority of parents of postsecondary graduates (98.1%) expected their son/daughter to attend a postsecondary institution. Only a very small percent (1.9%) of parents did not expect their son/daughter to attend a postsecondary setting. In terms of highest postsecondary credential attained by parents, 64.4% of reporting parents received some type of postsecondary credential. In addition, 54.1% of the spouse or partner of the reporting parent reported obtaining some type of postsecondary credential.

Table 10. Cross-tabulation for Parental Expectation and Level of Degree

<table>
<thead>
<tr>
<th>Parental Expectation</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely Will</td>
<td>N=486</td>
<td>N=6,113</td>
<td>N=1,159</td>
<td>N=7,758</td>
</tr>
<tr>
<td></td>
<td>12.3%</td>
<td>51.7%</td>
<td>81.9%</td>
<td>45.1%</td>
</tr>
<tr>
<td>Probably Will</td>
<td>N=2,761</td>
<td>N=5,680</td>
<td>N=256</td>
<td>N=8,697</td>
</tr>
<tr>
<td></td>
<td>70%</td>
<td>48%</td>
<td>18.1%</td>
<td>50%</td>
</tr>
<tr>
<td>Probably Will Not</td>
<td>N=632</td>
<td>N=38</td>
<td>N=0</td>
<td>N=670</td>
</tr>
<tr>
<td></td>
<td>16%</td>
<td>.3%</td>
<td>0%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Definitely Will Not</td>
<td>N=66</td>
<td>N=0</td>
<td>N=0</td>
<td>N=66</td>
</tr>
<tr>
<td></td>
<td>1.7%</td>
<td>0%</td>
<td>0%</td>
<td>.4%</td>
</tr>
</tbody>
</table>

Total N=3,945 N=11,831 N=1,415 N=17,191

\[X^2 = 4234.263, \text{df}=6, p<.000\] Cramer’s V=.351

**Parental Academic Expectation.** The results for parental academic expectation by type of degree were statistically significant, \[\chi^2 (6, N = 17,191) = 4234.26, p<.000.\] Cramer’s V for this finding (.4) indicated a moderate association between variables. Overall for the sample, the results indicated that 45.1% of parents stated that their son/daughter “definitely will” attend a
postsecondary school, 50% of parents stated that their son/daughter “probably will” attend a postsecondary school, 3.9% of parents stated that their son/daughter “probably will not” attend a postsecondary school, and .4% of parents stated that their son/daughter “definitely will not” attend a postsecondary school.

If we look at function of degree by parental expectation we notice large differences. The results of parental academic expectation by vocational/technical college degree indicated that 12.3% of parents stated that their son/daughter “definitely will” attend a postsecondary school, 70% of parents stated that their son/daughter “probably will” attend a postsecondary school, 16% of parents stated that their son/daughter “probably will not” attend a postsecondary school, and 1.7% of parents stated that their son/daughter “definitely will not” attend a postsecondary school.

If we look at the results of parental academic expectation by 2-year postsecondary degree we find that 51.7% of parents stated that their son/daughter “definitely will” attend a postsecondary school, 48% of parents stated that their son/daughter “probably will” attend a postsecondary school, and .3% of parents stated that their son/daughter “probably will not” attend a postsecondary school.

Finally, parental academic expectation by 4-year college/university had only two responses by parents “definitely will” and “probably will.” The results indicated that 81.9% of parents stated that their son/daughter “definitely will” attend a postsecondary school, 18.1% of parents stated that their son/daughter “probably will” attend a postsecondary school.

If we consider the percentage of respondents who reported that their son/daughter “definitely will” attend a postsecondary school, we note only 12.3% of parents reported this at the vocational/technical level, 51.7% at the 2-year postsecondary degree level and 81.9% at the
4-year postsecondary degree level. As the level of degree obtained increased the respondents were much more likely to indicate that their son/daughter “definitely will” attend a postsecondary school.

Table 11. Cross-tabulation for Parental Educational Attainment and Level of Degree

<table>
<thead>
<tr>
<th>Parental Edu Attainment</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th grade or less</td>
<td>N=986</td>
<td>N=726</td>
<td>N=0</td>
<td>N=1,712</td>
</tr>
<tr>
<td></td>
<td>25.3%</td>
<td>6.1%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>9th grade or above, not HS graduate</td>
<td>N=1,398</td>
<td>N=0</td>
<td>N=0</td>
<td>N=1,398</td>
</tr>
<tr>
<td></td>
<td>35.8%</td>
<td>0%</td>
<td>0%</td>
<td>8.2%</td>
</tr>
<tr>
<td>HS graduate or GED</td>
<td>N=729</td>
<td>N=1,234</td>
<td>N=566</td>
<td>N=2,529</td>
</tr>
<tr>
<td></td>
<td>18.7%</td>
<td>10.4%</td>
<td>40%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Post HS, no degree</td>
<td>N=182</td>
<td>N=114</td>
<td>N=173</td>
<td>N=469</td>
</tr>
<tr>
<td></td>
<td>4.7%</td>
<td>1%</td>
<td>12.2%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Voc/Tech degree</td>
<td>N=59</td>
<td>N=224</td>
<td>N=0</td>
<td>N=283</td>
</tr>
<tr>
<td></td>
<td>1.5%</td>
<td>1.9%</td>
<td>0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>2-YR/AA degree</td>
<td>N=162</td>
<td>N=154</td>
<td>N=75</td>
<td>N=391</td>
</tr>
<tr>
<td></td>
<td>4.2%</td>
<td>1.3%</td>
<td>5.3%</td>
<td>2.3%</td>
</tr>
<tr>
<td>4-YR/BA, BS degree</td>
<td>N=159</td>
<td>N=4,713</td>
<td>N=424</td>
<td>N=5,296</td>
</tr>
<tr>
<td></td>
<td>4.1%</td>
<td>39.8%</td>
<td>30%</td>
<td>30.9%</td>
</tr>
<tr>
<td>Some post BA, BS work, no degree</td>
<td>N=71</td>
<td>N=3,975</td>
<td>N=164</td>
<td>N=4,210</td>
</tr>
<tr>
<td></td>
<td>1.8%</td>
<td>33.6%</td>
<td>11.6%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Masters degree</td>
<td>N=156</td>
<td>N=393</td>
<td>N=13</td>
<td>N=562</td>
</tr>
<tr>
<td></td>
<td>4%</td>
<td>3.3%</td>
<td>.9%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Phd, MD, JD, LLB, other</td>
<td>N=0</td>
<td>N=298</td>
<td>N=0</td>
<td>N=298</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>2.5%</td>
<td>0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Total</td>
<td>N=3,902</td>
<td>N=11,831</td>
<td>N=1,415</td>
<td>N=17,148</td>
</tr>
</tbody>
</table>

\( X^2 = 10319.219, \text{df}=18, p<.000 \)  
Cramer’s V = .549
Parental Educational Attainment. The results for parental educational attainment by type of degree were statistically significant for level of degree obtained, $\chi^2 (18, N = 17,148) = 10319.22, p<.000$. Cramer’s $V$ for this finding (.5) indicated a high association between variables. Overall, 64.5% of parents had some type of postsecondary credential. The largest percentage of results indicated that 30.9% of parents stated that they had a 4-year degree. Of the remaining categories, 10% of parents earned an 8th grade education or less; 8.2% had earned a 9th grade education or above, but not a high school diploma; 14.7% had earned a high school diploma or received a GED; 2.7% had some post high school education, but no degree; 1.7% earned a vocational/technical degree; 2.3% earned a 2-yr college degree; and 24.6% earned some post BA, or BS degree; 3.3% earned a masters degree; and 1.7% earned a doctorate degree.

If we look at the percentages as a function of degree we find that majority of parents (79.8%) had only earned a high school diploma/GED or below at the vocational/technical degree level. Of the remaining, 12.2% had some post high school education but no degree; 4.2% earned a 2-yr college degree; 4.1% of parents stated that they had a 4-yr college degree; 1.8% earned some post BA, or BS degree; and 4% earned a masters degree.

When we look at the results by 2-year postsecondary degree we find that the majority of parents (82.4%) had earned a postsecondary credential. Of the remaining, 1% had some post high school education but no degree; 10.4% earned a high school diploma or GED; and 6.1% had an 8th grade education or less.

Results by 4-year degree showed that the majority of parents (52.2%) had not earned a postsecondary credential. Of the remaining, 5.3% earned a 2-yr college degree; 30% of parents stated that they had a 4-yr college degree; 11.6% earned some post BA, or BS degree; and .9% earned a masters degree.
Table 12. Cross-tabulation for Spouse Educational Attainment and Level of Degree

<table>
<thead>
<tr>
<th>Spouse/Partner Edu Attainment</th>
<th>Voc. Cert. N</th>
<th>2-YR Degree N</th>
<th>4-YR Degree N</th>
<th>Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th grade or less</td>
<td>0</td>
<td>8.2%</td>
<td>0%</td>
<td>6%</td>
</tr>
<tr>
<td>9th grade or above, not HS graduate</td>
<td>12</td>
<td>1.6%</td>
<td>0%</td>
<td>.6%</td>
</tr>
<tr>
<td>HS graduate or GED</td>
<td>1,501</td>
<td>2,235</td>
<td>90</td>
<td>3,826</td>
</tr>
<tr>
<td>Post HS, no degree</td>
<td>354</td>
<td>295</td>
<td>185</td>
<td>834</td>
</tr>
<tr>
<td>Voc/Tech degree</td>
<td>0</td>
<td>107</td>
<td>40</td>
<td>147</td>
</tr>
<tr>
<td>2-YR/AA degree</td>
<td>132</td>
<td>632</td>
<td>310</td>
<td>1,074</td>
</tr>
<tr>
<td>4-Yr/BA, BS degree</td>
<td>128</td>
<td>4,652</td>
<td>199</td>
<td>4,979</td>
</tr>
<tr>
<td>Some post BA, BS work, no degree</td>
<td>26</td>
<td>0%</td>
<td>60</td>
<td>86</td>
</tr>
<tr>
<td>Masters degree</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Phd, MD, JD, LLB, other</td>
<td>0</td>
<td>0%</td>
<td>124</td>
<td>124</td>
</tr>
<tr>
<td>Total</td>
<td>2,153</td>
<td>8,691</td>
<td>1,008</td>
<td>11,852</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 5610.140, \text{df}=16, p<.000 \text{ Cramer’s } V=0.486 \]

**Parental Spouse/Partner Educational Attainment.** The results for parental spouse/partner educational attainment by type of degree were statistically significant for level of
degree obtained, $\chi^2 (16, N = 11,852) = 5610.140, p<.000$. Cramer’s $V$ for this finding (.5) indicated a high association between variables. Overall, 54% of the spouse/partner of reporting parents had some type of postsecondary credential. The largest percentage of results indicated that 42% of parents stated that they had a 4-year degree. Of the remaining categories, 6% of parents earned an 8th grade education or less; .6% had earned a 9th grade education or above, but not a high school diploma; 32.3% had earned a high school diploma or received a GED; 3.4% had some post high school education, but no degree.

If we look at the percentage of respondents as a function of degree status, the results by vocational/technical degree showed that the majority of parents (86.7%) did not earn a postsecondary credential. Of the remaining, 6.1% earned a 2-yr college degree; 5.9% of parents stated that they had a 4-yr college degree; and 1.2% earned some post BA, or BS degree.

Unlike vocational/technical degree, results by 2-year postsecondary degree showed that the majority of parents (62%) had earned a postsecondary credential. Of the remaining, 3.4% had some post high school education but no degree; 25.7% earned a high school diploma or GED; .7% had 9th grade or above but not a high school degree; and 8.2% had an 8th grade education or less.

Results by 4-year degree showed that the majority (72.8%) of spouse/partners of the reporting parents had some type of postsecondary credential. Of the remaining, 18.4% had some post high school education but no degree, and 8.9% earned a high school diploma or GED.

What are the psychological characteristics of postsecondary graduates who are deaf or hard of hearing?

Hypothesis: Psychological variables (self-advocacy, friendship interaction, self-concept, and self-determination) among students who are deaf or hard of hearing strongly influence academic postsecondary completion.

**Psychological Variables.** Psychological factors that were normally distributed and
interval data were analyzed using an analysis of variance (ANOVA). When testing the significance between two or more groups, an ANOVA is an appropriate analysis to use. Relationships between the dependent variables (Vocational certificate, 2-year degree and 4-year degree) and the independent variables (self-concept, self-determination, math score and English score) were investigated.

Table 13. Cross-tabulation for Self-Advocacy and Level of Degree

<table>
<thead>
<tr>
<th>Level of Degree</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not At All</td>
<td>N=66</td>
<td>N=0</td>
<td>N=0</td>
<td>N=66</td>
</tr>
<tr>
<td>Very Well</td>
<td>.6%</td>
<td>0%</td>
<td>0%</td>
<td>.3%</td>
</tr>
<tr>
<td>Not Very Well</td>
<td>N=10,424</td>
<td>N=339</td>
<td>N=0</td>
<td>N=10,763</td>
</tr>
<tr>
<td></td>
<td>89.5%</td>
<td>3.3%</td>
<td>0%</td>
<td>46.4%</td>
</tr>
<tr>
<td>Well</td>
<td>N=536</td>
<td>N=3,312</td>
<td>N=605</td>
<td>N=4,453</td>
</tr>
<tr>
<td></td>
<td>4.6%</td>
<td>31.9%</td>
<td>53%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Very Well</td>
<td>N=625</td>
<td>N=6,737</td>
<td>N=536</td>
<td>N=7,898</td>
</tr>
<tr>
<td></td>
<td>5.4%</td>
<td>64.9%</td>
<td>47%</td>
<td>34.1%</td>
</tr>
<tr>
<td>Total</td>
<td>N=11,651</td>
<td>N=10,388</td>
<td>N=1,141</td>
<td>N=23,180</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 18016.434, \text{df}=6, p<.000 \text{ Cramer’s } V=.623 \]

**Self-Advocacy.** The results for self-advocacy by type of degree were statistically significant for level of degree obtained, \( \chi^2 (6, N = 23,180) = 18016.43, p<.000 \). Cramer’s *V* for this finding (.6) indicated a strong association between variables. Overall for the total sample, self-advocacy was reported by asking youth how well they asked for what they need, .3% reported not at all very well, 46.4% reported not very well, 19.2% reported well, and 34.1% said
very well. However, when we look at percentages as a function of degree status we find some large differences.

As presented in Table 13, at the vocational/technical level there were differences in student’s level of self-advocacy. When asked how well s/he asks for what they need, .6% of graduates reported “not at all very well”, 89.5% reported “not very well,” 4.6% reported “well,” and 5.4% reported “very well.” The results of self-advocacy by 2-year/community-college degree showed that students had higher levels of self-concept then at the vocational/technical and 4-year level. When asked how well s/he asks for what they need, 3.3% reported “not very well,” 31.9% reported “well,” and 64.9% of graduates reported “very well.” Finally, the results of self-advocacy by 4-year college/university found that 53% of students reported they asked for what they need “very well,” and 47% reported “well.” If we consider the percentage of respondents who reported they were doing well or very well, we note that as the level of degree obtained increased the respondents were much more likely to indicated doing well and very well.
Table 14. Cross-tabulation for Friendship Interaction and Level of Degree

<table>
<thead>
<tr>
<th>Can find a friend when youth needs one</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>N=80</td>
<td>N=0</td>
<td>N=0</td>
<td>N=80</td>
</tr>
<tr>
<td></td>
<td>3.2%</td>
<td>0%</td>
<td>0%</td>
<td>.5%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>N=1,483</td>
<td>N=860</td>
<td>N=91</td>
<td>N=2,434</td>
</tr>
<tr>
<td></td>
<td>59.8%</td>
<td>7.4%</td>
<td>8.9%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Yes</td>
<td>N=918</td>
<td>N=10,719</td>
<td>N=934</td>
<td>N=12,571</td>
</tr>
<tr>
<td></td>
<td>37%</td>
<td>92.6%</td>
<td>91.1%</td>
<td>83.3%</td>
</tr>
<tr>
<td>Total</td>
<td>N=2,481</td>
<td>N=11,579</td>
<td>N=1,025</td>
<td>N=15,085</td>
</tr>
</tbody>
</table>

\[ X^2 = 4677.422, \text{df}=4, \ p<.000 \quad \text{Cramer’s V=.394} \]

**Friendship Interaction.** The results for friendship interaction by type of degree were statistically significant for level of degree obtained, \( \chi^2 (4, N = 15,085) = 4677.42, p<.000 \). Cramer’s \( V \) for this finding (.4) indicated a moderate association between variables. Overall for the total sample .5% of degree completers said they could not find a friend when they needed one, 11.8% reported that only sometimes they could find a friend when they needed one, and 83.3% said that they could find a friend when they needed one.

When looking at friendship interaction as a function of degree we find that at the vocational/technical degree level 3.2% of degree completers said they could not find a friend when they needed one, 59.8% said that “sometimes” they could find a friend when they needed one, and 37% reported that they could find a friend when they needed one. At the 2-year postsecondary degree level we find that 7.4% of degree completers reported that “sometimes”
they could find a friend when they needed one, and that 92.6% of graduates reported that they
could find a friend when they needed one. None of the 2-year graduates indicated that they could
not find a friend when they needed one. Finally, when we analyze the percentages at the 4-year
postsecondary degree level we find that 8.9% of degree completers reported that “sometimes”
they could find a friend when they needed one, and that 91.1% of graduates reported that they
could find a friend when they needed one. None of the 4-year graduates indicated that they could
not find a friend when they needed one. When we look at the percentages of respondents that
indicated they could find a friend when they needed one we find that students were more likely
to find a friend at the 2-year and 4-year postsecondary degree level than at the
vocational/technical degree level.

**Self-Concept.** The results of the psychological demographic data for self-concept and
self-determination are reported by the mean of the summative scales of each subscale. Self-
concept was divided into two scales: level of confidence and level of importance. Both of these
subscales have ranges of low (1 to 15), medium (16 to 30), and high (31 to 45). The overall mean
score for the level of confidence scale was 38.9770, and the overall mean score for level of
importance was 31.0029.

Multiple one-way ANOVAs were conducted to compare the effect of self-concept by
level of self-confidence and level of importance on vocational, 2-year, and 4-year degree
attainment. The results for the self-concept level of confidence are presented in tables 15 and 16.
Table 15. Mean and Standard Deviation for Self-Concept Level of Confidence

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1211</td>
<td>33.114</td>
<td>9.82955</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>39.509</td>
<td>2.96963</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>41.077</td>
<td>3.26580</td>
</tr>
</tbody>
</table>

Table 16. ANOVA Table for the Relationship between Level of Confidence and Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>48850.231</td>
<td>2</td>
<td>24425.115</td>
<td>1338.241</td>
<td>.000**</td>
<td>.189</td>
</tr>
<tr>
<td>Within Groups</td>
<td>209291.693</td>
<td>11467</td>
<td>18.252</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>258141.924</td>
<td>11469</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the ANOVA analysis indicate that there is a statistically significant difference between the level of confidence on type of degree attained, [F(2, 11,469)=1338.24, p<.000]. The scale for level of confidence is low (1 to 15), medium (16 to 30), and high (31 to 45). Looking at the means as a function of degree status, each level scored in the high range (33.1140 to 41.0775).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is 6.3954 and the 95% confidence interval is 6.083 to 6.7015. This indicates that the 2-year respondents had a mean that was 6.1 to 6.7 points higher. Comparing vocational certificate and 4-year degree the mean difference is 7.9636 and the 95% confidence interval is 7.5407 to 8.3964. This indicated that the 4-year respondents had a
mean that was 7.5 to 8.3 points higher. Comparing the observed mean difference between 4-year degree and 2-year degree is 1.5682 and the 95% confidence interval is 1.2413 to 1.8951. This indicates that the 2-year respondents had a mean that was 1.2 to 1.9 points higher. These results suggest that as the level of degree increased the level of self-concept increased.

A second ANOVA was conducted to compare the relationship of self-concept by level of importance with vocational, 2-year, and 4-year degree attainment. The results for the self-concept levels of importance are presented in tables 17 and 18.

Table 17. Mean and Standard Deviation for Self-Concept Level of Importance

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1211</td>
<td>39.2386</td>
<td>6.79426</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>32.2973</td>
<td>4.58475</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>36.9722</td>
<td>5.33422</td>
</tr>
</tbody>
</table>

Table 18. ANOVA Table for the Relationship between Level of Importance and Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>65786.336</td>
<td>2</td>
<td>32893.168</td>
<td>1447.647</td>
<td>.000**</td>
<td>.202</td>
</tr>
<tr>
<td>Within Groups</td>
<td>260551.018</td>
<td>11467</td>
<td>22.722</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>326337.354</td>
<td>11469</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the ANOVA analysis indicate that there is a statistically significant difference between the level of confidence on type of degree attained, [F(2, 11,469)= 1447.65, p<.000]. The scale for level of importance is low (1 to 15), medium (16 to 30), and high (31 to 45). Looking at the means as a function of degree status, each level scored in the high range (32.2973 to 39.2386).
Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for vocational certificate minus 2-year is 6.9414 and the 95% confidence interval is 6.5999 to 7.2829. This indicates that the vocational certificate respondents had a mean that was 6.5 to 7.3 points higher. Comparing vocational certificate and 4-year degree the mean difference is 2.2662 and the 95% confidence interval is 1.7946 to 2.7382. This indicated that the vocational certificate respondents had a mean that was 1.8 to 2.7 points higher. Comparing the observed mean difference between 4-year degree and 2-year degree is 4.6750 and the 95% confidence interval is 4.3103 to 5.0397. This indicates that the 4-year respondents had a mean that was 4.3 to 5 points higher. In this study, students at the vocational/technical level indicated they felt more important and had a higher level of self-concept than students at the 2-year and 4-year degree levels. These results suggest that as the level of degree decreased conversely the degree level increased.

**Self-Determination.** Self-Determination was assessed in four different categories -- personal autonomy, autonomy in career planning, self-realization, and psychological empowerment. Multiple one-way ANOVA were conducted to compare the effect of each category of self-determination on vocational, 2-year, and 4-year degree attainment. The results are presented in Tables 19 through 26.

Table 19. Mean and Standard Deviation for Self-Determination by Personal Autonomy

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1211</td>
<td>26.6152</td>
<td>4.97537</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>31.4492</td>
<td>3.92190</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>31.0029</td>
<td>4.31594</td>
</tr>
</tbody>
</table>
The results of the ANOVA analysis indicate that there is a statistically significant difference between personal autonomy on type of degree attained, \(F(2, 11,469)= 812.95, p<.000\]. Responses for the category personal autonomy were reported on a 4-point Likert scale. The responses ranged from low (10-20), medium (21 to 30), and high (31-40). The mean score for graduates in the category of personal autonomy was 31.0029. Looking at the means as a function of degree status, respondents scored in the medium and high range (26.6152 to 32.1522).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is 4.8340 and the 95% confidence interval is 4.5446 to 5.1234. This indicates that the 2-year respondents had a mean that was 4.5 to 5.1 points higher. Comparing 4-year degree and vocational certificate the mean difference is 5.5370 and the 95% confidence interval is 5.1372 to 5.9367. This indicated that the 4-year respondents had a mean that was 5.1 to 5.9 points higher. Comparing the observed mean difference between 4-year degree and 2-year degree is .7029 and the 95% confidence interval is .3939 to 1.0120. This indicates that the 4-year respondents had a mean that was .4 to 1 point higher. These results
suggest that as the level of degree increased the level of personal autonomy increased.

Table 21. Mean and Standard Deviation for SD Autonomy in Career Planning

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1176</td>
<td>12.7798</td>
<td>3.04658</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>13.7790</td>
<td>2.52924</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>15.5971</td>
<td>2.61029</td>
</tr>
</tbody>
</table>

Table 22. ANOVA Table for Autonomy in Career Planning by Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>4582.571</td>
<td>2</td>
<td>2291.285</td>
<td>340.378</td>
<td>.000**</td>
<td>.056</td>
</tr>
<tr>
<td>Within Groups</td>
<td>76955.459</td>
<td>11432</td>
<td>6.732</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>81538.029</td>
<td>11434</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the ANOVA analysis indicate that there is a statistically significant difference between autonomy in career planning on type of degree attained, \( F(2, 11,469) = 340.38, p<.000 \). The summative scale for the category autonomy in career planning ranges from 5 to 20 with low scores being reported as (5 to 9), medium (10 to 15), and high (16 to 20). The mean score reported by graduates was 13.8424. Looking at the means as a function of degree status, respondents scored in the medium and high range (12.7798-15.5971).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is .9993 and the 95% confidence interval is .8109 to 1.1876. This indicates that the 2-year respondents had a mean that was .8 to 1.1 points higher. Comparing 4-year degree and vocational certificate the mean difference is 2.8174 and the
95% confidence interval is 1.6196 to 3.0759. This indicated that the 4-year respondents had a mean that was 1.6 to 3 points higher. Comparing the observed mean difference between 4-year degree and 2-year degree is 1.8181 and the 95% confidence interval is 1.6196 to 2.0166. This indicates that the 4-year respondents had a mean that was 1.6 to 2 point higher. These results suggest that as the level of degree increased the level of autonomy in career planning increased.

Table 23. Mean and Standard Deviation for SD Self-Realization

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1211</td>
<td>15.1569</td>
<td>1.99093</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>14.1998</td>
<td>2.02966</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>17.1215</td>
<td>1.86456</td>
</tr>
</tbody>
</table>

Table 24. ANOVA Table for the Relationship between SD Self-Realization and Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>8483.028</td>
<td>2</td>
<td>4241.514</td>
<td>1048.697</td>
<td>.000**</td>
<td>.155</td>
</tr>
<tr>
<td>Within Groups</td>
<td>46378.915</td>
<td>11467</td>
<td>4.045</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>54861.943</td>
<td>11469</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the ANOVA analysis indicate that there is a statistically significant difference between self-realization on type of degree attained, [F(2, 11,469)= 1048.797, p<.000]. The Self-Determination self-realization scale was measured on a 4-point Likert scale. The responses were grouped by low (5 to 9), medium (10 to 15), and high (16 to 20). The mean score for graduates in this study was at the top of the medium range at 14.5670. Looking at the means as a function of degree status, respondents scored in the medium and high range (15.1569-17.1215).
Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for vocational certificate minus 2-year is .9571 and the 95% confidence interval is .8130 to 1.1012. This indicates that the vocational certificate respondents had a mean that was .8 to 1.1 points higher. Comparing 4-year degree and vocational certificate the mean difference is 1.9646 and the 95% confidence interval is 2.7679 to 3.0756. This indicated that the 4-year respondents had a mean that was 2.8 to 3 points higher. Comparing the observed mean difference between 4-year degree and 2-year degree is 2.9217 and the 95% confidence interval is 2.7679 to 3.0756. This indicates that the 4-year respondents had a mean that was 2.8 to 3 points higher. These results suggest that self-realization is higher at the vocational certificate and 4-year degree level.

Table 25. Mean and Standard Deviation for SD Psychological Empowerment

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1211</td>
<td>3.6813</td>
<td>1.63913</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>5.9113</td>
<td>.36129</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>907</td>
<td>5.2315</td>
<td>.42204</td>
</tr>
</tbody>
</table>

Table 26. ANOVA Table for SD Psychological Empowerment by Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>R^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>5470.699</td>
<td>2</td>
<td>2735.349</td>
<td>6714.940</td>
<td>.000**</td>
<td>.542</td>
</tr>
<tr>
<td>Within Groups</td>
<td>4614.900</td>
<td>11329</td>
<td>.407</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10085.599</td>
<td>11331</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The results of the ANOVA analysis indicate that there is a statistically significant difference between psychological empowerment on type of degree attained, [F(2, 11,331)= 6714.94, p<.000]. The final scale for self-determination was the empowerment scale. Items on this scale were reported as low (0 to 2), medium (3 to 4) and high (5 to 6). The mean for this scale was 5.6186. Looking at the means as a function of degree status, respondents scored in the medium and high range (3.6813-5.9113).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is 2.2301 and the 95% confidence interval is 2.1843 to 2.2758. This indicates that the 2-year respondents had a mean that was 2.1 to 2.3 points higher. Comparing 4-year degree and vocational certificate the mean difference is 1.5503 and the 95% confidence interval is 1.4846 to 1.6160. This indicated that the 4-year respondents had a mean that was 1.5 to 1.6 points higher. Comparing the observed mean difference between 2-year degree minus 4-year degree is .6798 and the 95% confidence interval is .6277 to .7319. This indicates that the 4-year respondents had a mean that was .62 to .73 points higher. These results suggest that 2-year degree respondents had higher levels of psychological empowerment than graduates at the vocational certificate and 4-year degree level.

What are the educational setting and attainment characteristics of postsecondary graduates who are deaf or hard of hearing?

Hypothesis: Educational variables (math score, reading score and academic high school setting) among students who are deaf or hard of hearing strongly influence academic postsecondary completion.

Educational Variables. Educational variables used in this study were math score, reading score and academic high school setting. For the math and reading scores data were used from the Woodcock Johnson III (WJIII) math applied problems, math calculations, reading
passage comprehension, and reading antonyms/synonyms. Scores on the WJIII subtests are reported as standard scores that have a mean of 100 and a standard deviation of 15 in the general population. Scores below 70 are considered “very low” and are more than two standard deviations below the mean. Multiple one-way ANOVAs were conducted to compare the effect of math and English literacy on vocational, 2-year, and 4-year degree attainment. The results are presented in tables 27 through 34.

Table 27. Mean and Standard Deviation for Math Applied Problem

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1433</td>
<td>53.4438</td>
<td>27.43522</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>95.0979</td>
<td>10.38768</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>86.1196</td>
<td>16.28094</td>
</tr>
</tbody>
</table>

Table 28. ANOVA Summary for the Relationship between Applied Problems and Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2162521.49</td>
<td>2</td>
<td>1081260.74</td>
<td>5381.206</td>
<td>.000**</td>
<td>.479</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2348703.47</td>
<td>11689</td>
<td>200.933</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4511224.96</td>
<td>11691</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Math Applied Problems. The results of the ANOVA analysis indicate that there is a statistically significant difference between applied problems on type of degree attained, [F(2, 11,691)= 5381.21, p<.000]. Youth who are deaf or hard of hearing scored a mean of 89.1902 on the applied problems standard score of the math subtest on the WJIII. Looking at the means as a function of degree status, respondents scored in the low to average range (53.4438-95.0979).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean
differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is 41.6541 and the 95% confidence interval is 40.7106 to 42.5976. This indicates that the 2-year respondents had a mean that was 40.7 to 42.6 points higher. Comparing 4-year degree and vocational certificate the mean difference is 32.6758 and the 95% confidence interval is 31.3242 to 34.0274. This indicated that the 4-year respondents had a mean that was 31.3 to 34 points higher. Comparing the observed mean difference between 2-year degree minus 4-year degree is 8.9783 and the 95% confidence interval is 7.8937 to 10.0628. This indicates that the 2-year respondents had a mean that was 7.9 to 10 points higher. These results suggest that degree completers at the 2-year and 4-year postsecondary level had large differences from degree completers at the vocational certificate level. Graduates from the vocational certificate program scored “very low” on the math applied problems portion of the WJIII.

Table 29. Mean and Standard Deviation for Math Calculations

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1433</td>
<td>70.4641</td>
<td>18.40794</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>99.6135</td>
<td>10.16461</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>98.1005</td>
<td>23.48878</td>
</tr>
</tbody>
</table>

Table 30. ANOVA Summary for the Relationship between Calculations and Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1059255.34</td>
<td>2</td>
<td>529627.671</td>
<td>3075.242</td>
<td>.000**</td>
<td>.345</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2013115.60</td>
<td>11689</td>
<td>172.233</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3072370.95</td>
<td>11691</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Math Calculations.** The results of the ANOVA analysis indicate that there is a statistically significant difference between math calculations on type of degree attained, [F(2, 11,691)= 3075.24, p<.000]. On the math calculations subtest the mean score for youth who are deaf or hard of hearing was 95.9078. Looking at the means as a function of degree status, respondents scored in the low to average range (70.4641-98.1005).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is 29.1495 and the 95% confidence interval is 28.2759 to 30.0230. This indicates that the 2-year respondents had a mean that was 28.2 to 30 points higher. Comparing 4-year degree and vocational certificate the mean difference is 27.6364 and the 95% confidence interval is 26.3851 to 28.8877. This indicated that the 4-year respondents had a mean that was 26.4 to 28.9 points higher. Comparing the observed mean difference between 2-year degree minus 4-year degree is 1.5130 and the 95% confidence interval is .5090 to 2.5171. This indicates that the 2-year respondents had a mean that was .51 to 2.5 points higher. These results suggest that degree completers at the 2-year and 4-year postsecondary level had large differences from degree completers at the vocational certificate level. Graduates from the vocational certificate program scored “low” on the math calculations portion of the WJIII.

Table 31. Mean and Standard Deviation for Passage Comprehension

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1433</td>
<td>58.6455</td>
<td>20.13803</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>82.7217</td>
<td>13.01039</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>76.5809</td>
<td>24.36489</td>
</tr>
</tbody>
</table>
Table 32. ANOVA Summary for the Relationship between Passage Comprehension and Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>726864.764</td>
<td>2</td>
<td>363432.382</td>
<td>1539.195</td>
<td>.000**</td>
<td>.208</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2759988.84</td>
<td>11689</td>
<td>236.118</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3486853.60</td>
<td>11691</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Passage Comprehension.** The results of the ANOVA analysis indicate that there is a statistically significant difference between passage comprehension on type of degree attained, \[F(2, 11,691)= 3075.24, p<.000\]. On the English subtest, the mean for passage comprehension was 79.2221. Looking at the means as a function of degree status, respondents scored in the very low to below average range (58.6455-82.7217).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is 24.0762 and the 95% confidence interval is 23.0534 to 25.0990. This indicates that the 2-year respondents had a mean that was 23.1 to 25 points higher. Comparing 4-year degree and vocational certificate the mean difference is 17.9354 and the 95% confidence interval is 16.4702 to 19.4005. This indicated that the 4-year respondents had a mean that was 16.5 to 19.4 points higher. Comparing the observed mean difference between 2-year degree minus 4-year degree is 6.1409 and the 95% confidence interval is 4.9652 to 7.3166. This indicates that the 2-year respondents had a mean that was 5 to 7.3 points higher. These results suggest that degree completers at the 2-year and 4-year postsecondary level had large differences from degree completers at the vocational certificate level. Graduates from the vocational certificate program scored “very low” on the reading
passage comprehension portion of the WJIII.

Table 33. Mean and Standard Deviation for Synonym/Antonym Score

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Cert</td>
<td>1433</td>
<td>73.6469</td>
<td>17.91163</td>
</tr>
<tr>
<td>2-Year Degree</td>
<td>9214</td>
<td>95.0222</td>
<td>12.38631</td>
</tr>
<tr>
<td>4-Year Degree</td>
<td>1045</td>
<td>88.4852</td>
<td>19.09351</td>
</tr>
</tbody>
</table>

Table 34. ANOVA Summary for the Relationship between Synonym/Antonym Score and Degree Type

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>579370.634</td>
<td>2</td>
<td>289685.317</td>
<td>1502.616</td>
<td>.000**</td>
<td>.204</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2253490.79</td>
<td>11689</td>
<td>192.787</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2832861.42</td>
<td>11691</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Synonym/Antonym.** The results of the ANOVA analysis indicate that there is a statistically significant difference between synonym/antonym score on type of degree attained, \[F(2, 11,691)= 1502.62, p<.000\]. On the English subtest, the mean for synonym/antonym was 91.8182. Looking at the means as a function of degree status, respondents scored in the low to average range (73.6469-95.0222).

Post hoc pairwise comparisons using the Tukey HSD test indicated that the mean differences between the three groups were statistically significant. Comparing the observed mean difference for 2-year minus vocational certificate is 21.3754 and the 95% confidence interval is 20.4512 to 22.2995. This indicates that the 2-year respondents had a mean that was 20.5 to 22.3 points higher. Comparing 4-year degree and vocational certificate the mean difference is 14.8383.
and the 95% confidence interval is 13.5143 to 16.1622. This indicated that the 4-year respondents had a mean that was 13.5 to 16.2 points higher. Comparing the observed mean difference between 2-year degree minus 4-year degree is 6.5371 and the 95% confidence interval is 5.4747 to 7.5994. This indicates that the 2-year respondents had a mean that was 5.4 to 7.6 points higher. These results suggest that degree completers at the 2-year and 4-year postsecondary level had large differences from degree completers at the vocational certificate level. Graduates from the vocational certificate program scored “very low” on the reading synonym/antonym portion of the WJIII.

Table 35. Cross-tabulation for Academic Setting and Level of Degree

<table>
<thead>
<tr>
<th>Academic Setting</th>
<th>Level of Degree</th>
<th>Voc. Cert.</th>
<th>2-YR Degree</th>
<th>4-YR Degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>N=11947</td>
<td>N=10,554</td>
<td>N=984</td>
<td>N=23,485</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99%</td>
<td>99.9%</td>
<td>100%</td>
<td>99.4%</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>N=43</td>
<td>N=0</td>
<td>N=0</td>
<td>N=43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.4%</td>
<td>0%</td>
<td>0%</td>
<td>.2%</td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>N=74</td>
<td>N=13</td>
<td>N=0</td>
<td>N=87</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.6%</td>
<td>.1%</td>
<td>0%</td>
<td>.4%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>N=12,064</td>
<td>N=10,567</td>
<td>N=984</td>
<td>N=23,615</td>
<td></td>
</tr>
</tbody>
</table>

X² = 82.159, df=4, p<.000  Cramer’s V=.042

**Academic Setting.** The result for academic setting by type of degree was divided into three categories, public, private, and residential. After calculating the Chi-Square test of independence for academic setting attended, it was statistically significant, χ² (4, N = 23,615) = 82.16, p<.000. **Cramer’s V** for this finding (.04) indicated little if any association between
variables. Overall of the total sample, 99.4% of degree completers attended public schools, as compared to .2% who attended private schools and .4% who attended residential schools. If we look at academic setting as a function of degree we see that degree completers were more likely to attend public school over attending private or a residential school at every degree level. Looking at the percentage of respondents as a function of degree at the vocational/technical postsecondary degree level, 99% of degree completers attended public school, as compared to .4% that attended private school, and .6% that attended a residential school. Looking at the 2-year postsecondary degree level we find that 99.9% of degree completers attended public schools, as compared to 1% of degree completers who attended residential schools. Finally, at the 4-year postsecondary degree level we find that 100% of degree completers reported attending public schools. If we look at academic setting across degree levels we find that as the level of degree increased so did the percentage of public school attendance. In other words, a higher percentage of those completing a 2-year or 4-year degree are more likely to be a graduate of a public school.

Among students who are deaf or hard of hearing, what is the relationship of demographic/student, family, psychological, and school related factors to type of postsecondary completion, specifically vocational/technical certificate, 2-year degree, and 4-year degree?

Hypothesis: Student, family, psychological, and educational variables will have a strong relationship with postsecondary educational attainment.

A Pearson's product-moment coefficient correlation analysis was conducted on the psychological variables elf-concept, self-determination, self-advocacy and friendship interaction. The data showed no violation of normality, linearity or homoscedasticity. This procedure was used to determine the strength of the relationship between the variables in the study. Given the large sample sizes, it is expected that all of the correlations are statistically significant. Using Cohen’s (1988) general rules, a correlation of .2 is considered weak, .5 is considered moderate,
and .8 is considered strong. Looking at Table 36, we see that the majority of correlations between psychological variables were statistically significant.

When we consider those correlations that are at the moderate level we find that friendship interaction has a positive relationship with empowerment ($r=.699$, $n=14901$, $p<.000$), level of confidence ($r=.622$, $n=15086$, $p<.000$), and self-advocacy ($r=.645$, $n=13269$, $p<.000$). We also find that self-advocacy is moderately correlated with realization ($r=.703$, $n=23180$, $p<.000$), autonomy ($r=.734$, $n=23143$, $p<.000$), and level of importance ($r=.633$, $n=23180$, $p<.000$).

When we consider those correlations that are at the strong level we note that empowerment has a strong, positive correlation with realization ($r=.905$, $n=25401$, $p<.000$), autonomy in career planning ($r=.930$, $n=25364$, $p<.000$), autonomy ($r=.961$, $n=25401$, $p<.000$), level of importance ($r=.863$, $n=25401$, $p<.000$), level of confidence ($r=.973$, $n=25401$, $p<.000$), and self-advocacy ($r=.832$, $n=22995$, $p<.000$). We also find that realization has a strong, positive correlation with autonomy in career planning ($r=.970$, $n=25549$, $p<.000$), autonomy ($r=.969$, $n=25585$, $p<.000$), level of importance ($r=.979$, $n=25585$, $p<.000$), and level of confidence ($r=.964$, $n=25585$, $p<.000$). Strong, positive correlations were also found between autonomy in career planning and autonomy ($r=.959$, $n=25549$, $p<.000$), level of importance ($r=.944$, $n=25549$, $p<.000$), and level of confidence ($r=.967$, $n=25549$, $p<.000$). We also find that autonomy has a strong, positive correlation with level of importance ($r=.938$, $n=25585$, $p<.000$), level of confidence ($r=.990$, $n=25585$, $p<.000$), and self-advocacy ($r=.805$, $n=23180$, $p<.000$). Finally, level of confidence had a strong positive correlation with level of importance ($r=.938$, $n=25585$, $p<.000$), and self-advocacy ($r=.804$, $n=23180$, $p<.000$).
Table 36. Correlations for Psychological Variables

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Determination Empowerment</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.905</td>
<td>.930</td>
<td>.961</td>
<td>.863</td>
<td>.973</td>
<td>.832</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25401</td>
<td>25401</td>
<td>25364</td>
<td>25401</td>
<td>25401</td>
<td>25401</td>
<td>22995</td>
</tr>
<tr>
<td>Self-Determin Self-Realization</td>
<td>Pearson Correlation</td>
<td></td>
<td>1</td>
<td>.970</td>
<td>.969</td>
<td>.979</td>
<td>.964</td>
<td>.703</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25585</td>
<td>25549</td>
<td>25585</td>
<td>25585</td>
<td>25585</td>
<td>23180</td>
</tr>
<tr>
<td>Self-Determin Autonomy Career Plan</td>
<td>Pearson Correlation</td>
<td></td>
<td>1</td>
<td>.959</td>
<td>.944</td>
<td>.967</td>
<td>.734</td>
<td>.255</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25549</td>
<td>25549</td>
<td>25549</td>
<td>25549</td>
<td>23143</td>
<td>15086</td>
</tr>
<tr>
<td>Self-Determination Autonomy</td>
<td>Pearson Correlation</td>
<td></td>
<td></td>
<td>1</td>
<td>.938</td>
<td>.990</td>
<td>.805</td>
<td>.473</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25585</td>
<td>25585</td>
<td>25585</td>
<td>23180</td>
<td>15086</td>
</tr>
<tr>
<td>Self-Concept: Level of Importance</td>
<td>Pearson Correlation</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.938</td>
<td>.633</td>
<td>-.361</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25585</td>
<td>25585</td>
<td>23180</td>
<td>15086</td>
</tr>
<tr>
<td>Self-Concept: Level of Confidence</td>
<td>Pearson Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.804</td>
<td>.622</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25585</td>
<td>23180</td>
<td>15086</td>
</tr>
<tr>
<td>Self-Advocacy</td>
<td>Pearson Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.645</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11470</td>
</tr>
<tr>
<td>Friendship Interaction</td>
<td>Pearson Correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11470</td>
</tr>
</tbody>
</table>
Summary

This chapter reported the results of investigating characteristics associated with postsecondary educational attainment among students who are deaf or hard of hearing. The hypotheses that personal, family, educational, and psychological characteristics among students who are deaf or hard of hearing strongly influence academic postsecondary completion was tested. The variables gender, race, math literacy, reading literacy, academic setting (public/residential), communication modality (sign language/oral speech), cochlear implant user, parental academic expectation, parental educational attainment, self-determination, self-concept, self-advocacy, and friendship interaction were analyzed to determine if there was a relationship with postsecondary attainment. All of the variables had some level of statistical significance. Chapter five provides a discussion of the findings and recommendations for future research.
CHAPTER FIVE: DISCUSSION

This exploratory study analyzed the characteristics associated with postsecondary educational attainment among students who are deaf or hard of hearing using data from the National Longitudinal Transition Study 2 (NLTS2). The variable *postsecondary attainment* was defined as degree levels; vocational/technical certificate, 2-year community college degree, and 4-year college/university degree. This study sample only included youth who attended a postsecondary program and completed a degree. Youth who withdrew from college prior to degree completion were excluded from the sample. This final chapter presents a summary of the study, the discussion section, delimitations and limitations of the study, and recommendations for future research.

Summary of the Study

This study tested the hypotheses that personal, family, educational, and psychological characteristics among students who are deaf or hard of hearing strongly influence academic postsecondary completion. While there are a handful of studies that have investigated attrition in the postsecondary setting (Walter, G., & DeCaro, J, 1986; Bowe, 2003; Wagner, et al., 2005), few studies have conducted research on the characteristics of successful postsecondary graduates who are deaf or hard of hearing. Identifying characteristics of successful postsecondary graduates is helpful in transition planning, academic advising, retention strategies, and for clarifying gaps in service.

The data used in this study were commissioned by the U.S. Department of Education to provide information regarding the characteristics of secondary school youth receiving special education services. Begun in 2001, the NLTS2 was a ten-year longitudinal study as a follow-up to the first National Longitudinal Transition Study (1985-1983). Data were collected from
participants in waves one, two three, four and five; which was about every two years. Waves 1, 2 and 3 collected demographic, personal and school characteristics, and direct assessments. Waves four and five collected following up information post high school, including postsecondary attendance and attainment. Only recently released, Wave 5 data were not available at the time of data analysis for this study. Therefore, the waves analyzed for this study were waves one, two, three and four.

This investigation included only youth who were diagnosed as deaf, hard of hearing or hearing impaired, and who had received some type of postsecondary credential. This study was exploratory in nature with the goal being to describe the population of postsecondary graduates who are deaf or hard of hearing, including a focus on characteristics of successful students who held different types of postsecondary degrees.

**Research Questions**

The following research questions were investigated.

1. What are the personal characteristics of postsecondary graduates who are deaf or hard of hearing?
   - Demographic/student variables included gender, race, cochlear implant user, communication modality, and type of sign language used.

2. What are the family characteristics of postsecondary graduates who are deaf or hard of hearing?
   - Family variables included parental academic expectation and parental educational postsecondary attainment.

3. What are the psychological characteristics of postsecondary graduates who are deaf or hard of hearing?
• Psychological variables included self-concept, self-determination, self-advocacy and friendship interaction

4. What are the educational setting and attainment characteristics of postsecondary graduates who are deaf or hard of hearing?

• Educational variables included math score, reading score and high school academic setting (public, private or residential)

5. Among students who are deaf or hard of hearing, what is the relationship of demographic/student, family, psychological, and school related factors to type of postsecondary completion, specifically vocational/technical certificate, 2-year degree, and 4-year degree?

**Discussion**

**Gender**

The finding of this study indicated that personal student variables highly influence postsecondary completion and indicate that gender played an important role in the level of degree attained. Overall, males earned postsecondary degrees more often than females. When gender was analyzed by type of degree earned, males earned a postsecondary certificate/degree more often than females, with the number of males greatly declining at the 2-year and 4-year levels. Males earned more technical/vocational degrees at greater number than females, and females earned more 2-year and 4-year postsecondary degrees than males.

Within the general population of all students, females outnumber males in enrolling and participating in higher education. Between 1994 and 2004, females had a 6% increase in enrollment, while males only had a 2% increase in enrollment (Cook & Cordova, 2007). Community colleges have seen tremendous enrollment growth as compared to four-year
institutions. Among students that transfer to a four-year college from a community college, females are more likely than males to attain a bachelor’s degree (Wang, 2009). Enrollment at the community college level by gender has shown a steady increase by females. In terms of undergraduate enrollment by gender in the general population, females account for 57% of the student body, while males account for only 43% (Aud, 2010a; Aud, 2010b). It is predicted that by 2019 females will outnumber males by accounting for 59% of the enrollment (Aud et al, 2010b).

Empirical evidence that male students who are deaf or hard of hearing struggle to obtain higher degrees will guide the field to develop and provide resources to support these students in expanding their educational goals to succeed beyond the vocational/certificate level. For example, the Center for Deaf and Hard of Hearing at New River Community College (2003), recognizing that “Effective orientation lays the groundwork for student success at the postsecondary level” (p. 17) developed a specialized orientation program for deaf and hard of hearing students.

Preparing deaf students to effectively function within their institution and the surrounding community is a great challenge. Given the enormity of this task, it is not surprising that a growing number of programs serving deaf and hard of hearing students have found their general college orientation less than effective in meeting these students’ needs and are turning toward specialized orientation initiatives. In response to this need, programs affiliated with the PEC (Postsecondary Education Consortium) collaborated to produce a model curriculum for a specialized orientation program (p. 17).

While not directly focusing on males apart from females, this type of program does address one aspect of college success, i.e., effective orientation for new students. Recruitment and retention programs in 2-year and 4-year educational settings that specifically targeted deaf and hard of hearing males may be warranted by such data as presented in the research of Aud and this study.
Race

While females already outnumber males in terms of postsecondary enrollment in the general population, the largest gap between male and female enrollment among racial/ethnic groups is by African American students with 64% being female (Aud et al, 2010a). In addition, twice as many African American females received Bachelor degrees in 2008, than African American males (Aud et al, 2010a). In this study, among minority groups, the higher the degree earned the more likely African Americans were to obtain a degree as compared with Hispanics and Asian/Pacific Islanders.

The overall results regarding race in this study revealed overall that Caucasian students who are deaf or hard of hearing obtained postsecondary degrees more often than African Americans, Hispanics, or Asian/Pacific Islanders who are deaf or hard of hearing. Overall Caucasians constituted 80.1% of graduates across all three postsecondary degree levels followed by Hispanics at 14.1%, African Americans at 4% and Asians at 1.8%.

Within minority groups in this study, African Americans slightly increased as a percentage of graduates from vocational/technical to 2-year level (2.8% to 3.5%) but increased dramatically from 2-year to 4-year (3.5%, to 19.8%). Conversely Hispanics decrease as a percentage of graduates over degree level (19.7 vocational/technical; 9.3% 2-year, 4.1% 4-year). Asians/Pacific Islanders increased slightly over degree levels (.8% vocational/technical; 2.6% 2-year, 3.9% 4-year).

Analyzing demographical changes in the general population from 1980 to 2008 at postsecondary institutions, general student population change for Caucasians reflects a decline from 80% to 66%. The Hispanic student population increased from 6% to 15% while the African American student population remained about the same at 12% (Aud, Fox, KewalRamani, &
National Center for Education Statistics, 2010). Earned postsecondary degrees for students of color have increased, yet a gap still remains when compared to the number of postsecondary degrees earned Caucasian students.

Students who have the dual identity of being deaf or hard of hearing and belonging to a racial or ethnic minority group, are at risk in postsecondary educational settings for low degree obtainment. While more students who are deaf or hard of hearing are enrolling in higher education, the majority of them do not succeed (Wagner et al., 2005). Particularly at risk are students who are African Americans, which have the highest rate of disability (U.S. Census Bureau, 2005) and enroll in college and succeed in postsecondary education at a much lower rate than Caucasians (Noeth & Wimberly, 2002).

Postsecondary education has begun to address the unique needs of minority students. For example, ACT (formerly American College Testing) conducts educational and policy research with reports published online. Noeth and Wimberly (2002) authored an ACT policy report investigating postsecondary planning of African American and Hispanic high school seniors in five major urban school districts. The goal of the study was to use empirical data to support the creation of seamless educational transitions for African American and Hispanic students. Working with the Council of Great City Schools, ACT’s research resulted in recommendations for districts (ex: “Districts need to provide counselors, starting in middle school, whose major tasks are to deal with the college exploration and postsecondary planning process” p.35.), schools (ex: “Schools should integrate a postsecondary planning component into extracurricular activities” p. 37.), and school personnel (ex: Counselors, teachers, principals, and other personnel should work to establish both formal and informal relationships with their students to assist them in various phases of the postsecondary planning process” p. 35.) for enhancing the
transition process from high school to postsecondary learning for minority students. Further investigation and the application of research conducted with hearing minority students to deaf and hard of hearing minority students is needed.

**Communication Modality**

The results of this study indicated a relationship between communication modality (sign language, lip reading, cued speech, and oral speech) and postsecondary completion by level of degree obtained. Across all programs 96.7% of students chose oral speech as their primary mode of communication. Second choice of students was sign language (79.6%) followed by lip reading (32.8%) and cued speech (26.4%).

The study on communication modality brings up more questions than it answers. Students had the option to choose more than one mode on this questionnaire, and the majority of them chose several modes. In fact, some students choose both cued speech and sign language. Additionally, no definitions were provided; therefore, it is not known if students understood the definitions of all communication modalities or if students applied accurate distinctions among modality categories when answering the questions. For example, cued speech, while used in educational settings in most states, and in twenty countries, (Haacke, 2005) is not used by large numbers of deaf and hard of hearing individuals.

“Today, the cued speech community constitutes a tiny fraction of deaf Americans. In 2005, fewer than 200 of 37,500 [.005%] deaf and hard-of-hearing students in elementary and secondary schools nationwide used the technique as their primary mode of communication with teachers, a survey by the Gallaudet Research Institute found” (Dechter, 2006, ¶ 10).

No literature was located on the use of cued speech in postsecondary settings to either support or refute the finding of 26.4% student use in this study.
Students selected their mode of communication in waves one, two, and three of this study, which meant most students, were still in high school at those times. It is possible that students are using a variety of modes to communicate in postsecondary settings depending on the accommodations available. The other possibility, as mentioned above, is that students did not understand the differences between modalities and simply checked more than one. Finally, another possibility is that students use sign language socially with other students who are deaf, and use either Cued Speech in limited ways (ex: speech therapy) or may use an oral speech method together with lip reading in the classroom or when interacting with hearing peers.

Students who are deaf or hard of hearing need to be able to clearly describe and advocate for the communication modality they prefer for the postsecondary setting. When choosing a postsecondary institution, students need to be knowledgeable about the range of accommodations available, including communication access, not only in the classroom, but for campus activities as well. Having an interpreter for class does not always ensure that students are having their needs met to participate in the full academic experience. In fact, students who are oral and sign language users have expressed that they miss content in the classroom even with support services (Spradbrow & Power, 2004; Marschark, Sapere, Convention and Seewagen, 2005).

Given this fact, disability support providers may benefit from the information in this study to guide them in ensuring that students who are deaf and hard of hearing are immersed in all aspects of the postsecondary environment regardless of their communication modality. In some cases, students may request more than one type of communication modality. For example, Walter et al (2007) reported an increase in the number of requests in the college setting by deaf and hard of hearing students for speech to text services, especially for technical classes such as math.
Type of Sign Language Used

The finding in this study indicated a relationship between type of sign language used and postsecondary attainment by level of degree. The majority of students at each postsecondary level reported using American Sign Language more often than either Signed English or some other sign language system. At the 4-year level, 100% of students reported use of American Sign Language.

Gallaudet Research Institute (GRI) provides yearly demographics on Deaf and Hard of Hearing Children and Youth. No comparable data are reported for postsecondary students; however, the data are enlightening. The 2009-2010 study (GRI, 2011) reports 18,988 students used the following support services (p. 9):

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral transliteration services</td>
<td>0.7%</td>
</tr>
<tr>
<td>Cued speech transliteration</td>
<td>0.4%</td>
</tr>
<tr>
<td>Sign transliteration services [signed English]</td>
<td>13.7%</td>
</tr>
<tr>
<td>Deaf-blind interpreting services</td>
<td>0.4%</td>
</tr>
<tr>
<td>Sign language instruction</td>
<td>21.9%</td>
</tr>
<tr>
<td>Cart, C-Print, Typewell [Speech to text]</td>
<td>0.3%</td>
</tr>
<tr>
<td>Other Services Received in Support of Instruction</td>
<td>65.66%</td>
</tr>
</tbody>
</table>

The study also reported communication mode primarily used to teach students (p. 11):

<table>
<thead>
<tr>
<th>Mode</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spoken language only</td>
<td>53.0%</td>
</tr>
<tr>
<td>Sign language only</td>
<td>27.4%</td>
</tr>
<tr>
<td>Sign supported spoken language (SIMCOM)</td>
<td>12.1%</td>
</tr>
<tr>
<td>Spoken language with cues</td>
<td>5.0%</td>
</tr>
<tr>
<td>Other</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

The GRI results concur with the findings of this study. Oral speech is the primary communication method used to teach students, and requested most often by postsecondary students, with cued speech being the least often method used to teach students and requested least frequently by postsecondary students. While the results cannot be linearly interpreted, it does suggest that the communication modality used in K-12 educational settings is carried forth
into postsecondary settings. With the reported rise in the request for speech to text services for technical classroom instruction, and the increase in students receiving cochlear implants from 5.3% in 1999-2000 (Gallaudet Research Institute, 2001) to 15% in 2009-2010 (Gallaudet Research Institute, 2011), it will be interesting to see if the ranking of communication modalities and types of sign language used will change in the future. Additionally it is not now known how these changes may impact the provision of communication accommodations to postsecondary students in the future.

Cochlear Implant

The results of this study indicated a negative relationship between use of a cochlear implant and level of degree attained. Out of the total sample of degree completers in this study only 1.8% reported the use of cochlear implants. It is unknown whether it is too soon to document postsecondary outcomes or if non-completers are more likely to have cochlear implantation as compared to degree completers. Little is known about postsecondary outcomes of graduates who have a cochlear implant. In fact, the first child in the State of Texas to have a cochlear implant was recently highlighted in a Dallas news release (Carpenter, 2010) applauding his academic success as a graduate at Southern Methodist University. The majority of research available on individuals with a cochlear implant has been mainly focused on auditory performance, speech intelligibility, and implant experience; only a handful of studies have documented academic outcomes with youth who have cochlear implants. The finding in this study supports Convertino, Marschark, Sapere, Sarchet, and Zupan’s (2009) finding that cochlear implantation was not a predictor of college readiness. In their study of learning and academic achievement scores of deaf students with and without cochlear implants they found that ACT
composite scores were the best predictor of college readiness, not whether or not they had an implant.

As the number of individuals who use a cochlear implant increase, one can anticipate that the number of college students with a cochlear implant will increase as well. In the United States, there are approximately 42,600 adults and 28,400 children who have received implants (NIH, 2011). Perhaps in the near future more outcomes with students who have a cochlear implant will be available.

**Parental Academic Expectation**

The results of this study supported the hypothesis that family variables would highly influence postsecondary completion. Overall for the sample, the majority of parents (95.1%) had strong expectations that their son/daughter *definitely would* or *probably would* attend a postsecondary setting. When considering parental academic expectation by type of degree earned, a strong relationship was noted. The results showed the higher the degree obtained the more likely parents were to indicate that their son/daughter “*definitely would*” attend a postsecondary school. This finding is consistent with several studies that were conducted in the 1970s and 80s that analyzed the relationship of students’ educational aspirations and parental expectation; positive results were found in all these studies (Ekstrom, 1985; Pennsylvania Association of Colleges and Universities, 1984; Russell, 1980; Soper, 1971; Tillery, 1973). Not much has changed in the last several decades. Parents are still a large influence on how educational aspirations are developed and fostered in their children. Parents who did not attend college tend to have lower educational expectations for their children than do parents who attended college (Choy, 2001). In addition, Weinberg (2010) found that parental academic expectation was
directly related to SES, the lower the income that parents had the lower educational expectations
they held about their children.

Research has indicated that parents of children with disabilities have lower academic
expectations than parents of children without disabilities (Shandra & Hogan, 2009). The National
Longitudinal Transition Study 2 (Newman, 2005) reports youth with disabilities are more likely
to live in a single parent home than youth without disabilities. When parents were asked about
their academic expectations only 25% expected that their children would definitely attend
postsecondary school, and 38% definitely thought their children would not attend college.

Another key finding from this report stated:

Families with higher expectations for their children’s postsecondary educational
attainment are less likely to help with homework but more likely to be involved at school
than families of youth with disabilities who are less optimistic for their children’s
continued education. (p. 4-19)

While this study showed that parents may have lower expectations related to postsecondary
goals, they were more likely to be involved in school activities than parents of children without a
disability.

The finding in this study is important for the field of early intervention educators and
parent outreach coordinators. Understanding that parental educational expectation is an
important factor in postsecondary success will guide practitioners to infuse their training
modules with information related to having high academic expectations for youth who are deaf
or hard of hearing.

Parental Educational Attainment

The results of this study indicated there was a relationship between parental educational
attainment, for both the reporting parent and their partner/spouse, and level of degree attainment.
This finding is also consistent with studies over the last several decades that have found a
positive relationship between parental postsecondary attainment and predisposition to attend college in the general population (Carpenter & Fleishman, 1987; Gilmour et al., 1978; Hossler & Stage, 1987; Jackson, 1986; Manski & Wise, 1983; Solomon & Taubman, 1973; Stage & Hossler, 1989; Trent & Medsker, 1967; Tuttle, 1981; Yang, 1981). The majority of graduates in this study had parents who had obtained some type of postsecondary credential. Overall for this study 64.5% of reporting parents and 54% of the parent’s partner/spouse had some type of postsecondary credential.

It is well documented in literature that the higher the degree and income of the parents the more likely the student will obtain a postsecondary degree (Carpenter & Fleishman, 1987; Gilmour et al., 1978; Hossler & Stage, 1987; Jackson, 1986; Manski & Wise, 1983; Solomon & Taubman, 1973; Stage & Hossler, 1989; Trent & Medsker, 1967; Tuttle, 1981; Yang, 1981). Institutions of Higher Education are well aware of the fact that students are more likely to succeed if they come from a family where one or both parents have a postsecondary degree. Students who are the first in their family to attend college, first-generation students, have lower rates of college persistence than do students who come from a family whose parents have been to college (Casbrera, et al, 1992).

An effort has been made at both the federal and state level to provide more support for low income and first generation college students with programs such as TRiO (Upward Bound, Veterans Upward Bound, Math-Science Upward Bound, Educational Talent Search, Student Support Services, the Ronald E. McNair Post-Baccalaureate Program, and Educational Opportunity Centers). However, these programs are limited to a select number of postsecondary institutions and only serve approximately 10% of the eligible population (Jean, 2011). Additionally TRiO programs are mandated to serve low income, first generation students. While
these programs do serve students with disabilities, the majority of students they serve are non-disabled. The number of students who are deaf or hard of hearing that are served by programs like TRiO is low and these students may have barriers to accessing these type of school-related programs.

**Self-Concept**

The results of this study indicated there was a strong relationship between self-concept and level of degree earned for both level of confidence and level of importance. Research has documented that academic self-concept is a predictor of educational attainment and educational attainment is a predictor of self-concept (Marsh and O’Mara, 2011). Academic self-concept is “a mixture of self-beliefs and self-feelings regarding general academic function” (Lent et al., 1997, p. 308).

Self-beliefs and self-feelings viewed through a career theory lens can be best described by social cognitive career theory. According to SCCT (Lent et al., 1994 & 1995; Lent, 2005) students develop their perception of self is through personal performance accomplishments. Students who are deaf or hard of hearing and have a limited repertoire of successful past performances may hold low self-beliefs regarding general academic function. Additionally, SCCT states that students also develop their self-perception through vicarious learning; however, students who are deaf or hard of hearing have access to few language models and mentors. The third component of developing self-perception is through social persuasion, and many deaf or hard of hearing youth have internalized society’s views of persons with disabilities as less capable. Finally, the fourth component of developing self-perception is through physiological states and reactions. Individuals who are deaf or hard of hearing may exhibit communication anxiety when mainstreamed with mainly hearing peers. Given these facts it is reasonable, then,
to believe that youth who are deaf and hard of hearing may hold low self-beliefs and self-feelings that can depress aspirations and career goals leading to low academic and career attainment.

Youth who are deaf or hard of hearing need to be given opportunities to experience a sense of competence in many areas. These competencies will help to shape their self-beliefs and self-feelings with each competency they gain. Often just participating helps to enhance self-concept by feeling included. Wells, Bhattacharya and Morgan (2009) found that positive incidents in the workplace increased levels of self-concept:

As Bandura (1986) suggested, the experiences people encounter throughout life help to form beliefs about themselves as they interact with others within their environment. For example, when our participants encountered positive incidents, they experienced greater self-esteem and, therefore, a higher self-concept. Conversely, when the Deaf employees encountered negative incidents, they experienced a decrease in self-esteem and, therefore, a lower self-concept (p.114).

Wells et al. also found that deaf employees had higher levels of self-concept when they were able to participate in meetings and conversations with hearing employees when an interpreter was provided. As supported by Wells et al. and by this study, self-concept is an important construct for individuals who are deaf or hard of hearing to be full participants in both their school and work environments.

Self-Determination

The results of this study found a relationship between self-determination and level of degree earned. Self-determination is the intrinsic motivation one has to succeed free from any extrinsic pressures. Students are more responsible in adulthood if they have participated in activities that promote self-determination and were proactive about planning their future (Malian & Nevin, 2002; Price, Wolensky, & Mulligan, 2002). It is important not only for students to have self-determination, but for teachers and parents to foster opportunities for students to develop
their self-determination and self-worth. Sands, Spencer, Gliner and Swaim (1999) found that students who are perceived as less competent in the employment and social setting by the teacher were given less educational opportunities to prove otherwise. Students, who are perceived as incompetent, need to be given opportunities to show their competence in various performance area, so they could acquire the self-determination needed to navigate the social and work environment.

Promoting activities to increase self-determination in the postsecondary setting will help to improve college retention. In an article that highlighted the disability support services at Virginia Commonwealth University (VCU), Gretzel (2008) addressed the persistence of students with disabilities. Gretzel states that VCU uses a three-step approach to serving students with disabilities; direct coaching, consultation, and monitoring. In addition, she purports that implementing self-determination skills, self-management skills, access to technology, and internships improve college retention for students with disabilities. Additionally, Jameson (2007) analyzed the impact of self-determination in the postsecondary setting. This study investigated students who had attended a two-year, private college between 1993 and 2002. The results indicated that students who scored higher on the ARC Self-Determination scale had more positive outcomes, and students who scored low on the ARC had negative outcomes. As supported by Gretzel, Jameson and this study, self-determination promotes positive outcomes in the postsecondary setting.

Self-Advocacy

The results of this study found a very strong relationship between self-advocacy and level of postsecondary degree obtained by graduates who are deaf or hard of hearing. According to Fogg and Harrington (2009) a key determinant of persistence and success for persons with
disabilities is self-advocacy. Self-advocacy was first coined in reference to the civil rights movements for persons with disabilities (Test, Fowler, Wood, Brewer, & Eddy, 2005; William & Shoultz, 1982). Many students with disabilities lack the assertiveness necessary to self-advocate for accommodation they need to be successful in school (Corcoran 2010; Smith, English & Vasek, 2002). Additionally students with disabilities transitioning from high school to postsecondary settings may be unaware of the need to request services, how to request them, and how to resolve differences in opinion regarding appropriate accommodations (Palmer & Roessler, 2000).

Students need to be taught how to request and self-advocate for the services they need in postsecondary settings (Smith et al, 2002 as reported by Cocoran, 2010). Recognizing this fact, IDEA, the Individuals with Disabilities Act (1990, amended 1997), established long-term transition training for students age 14 and above to prepare them for transition from high school to postsecondary education or employment. A key component of this transition planning is self-advocacy reported by Fogg and Harrington (2009) and supported by this study of characteristics associated with postsecondary educational attainment.

**Friendship Interaction**

The results of this study found that friendship interaction had a strong relationship with level of college degree attained by deaf and hard of hearing graduates. This is an important finding because the stigma related to having a disability fosters negative perceptions for many individuals with a disability. Some of these stigmatizing perceptions are that students with disabilities are devalued by non-disabled persons and have decreased emotional wellbeing (Green, 2007). Internalizing public perceptions may cause persons with disabilities to experience loss of self-esteem and self-efficacy (Watson & Larson, 2006). In the college setting where
socialization and cognitive development between peers is vital, students with disabilities can feel isolated and rejected. Tinto’s Model of Retention (1993) states the importance of group interaction as a factor of college success; therefore, social inclusion and interaction builds self-esteem, increases one’s level of acceptance and, as this study reports, is a characteristic of successful postsecondary educational attainment.

**Math Literacy**

There was a relationship between math literacy and postsecondary degree attainment. The majority of graduates scored below the average mean on the math applied problem solving and calculations portions of the Woodcock Johnson III. The youth in this study scored higher on the calculations subtest at all degree levels. Ironically, youth scored higher at the 2-year degree level on both the applied problem solving and the calculations subtests. It’s not surprising that students struggled with the applied problem solving more than on the calculations subtests. Several studies have linked poor reading ability with the difficulty students have with math problem solving (Kidd & Lamb, 1993; Pagliaro & Ansell, 2002; Serreno Pau, 1995). In fact, Traxler (2000) conducted a study to norm the Stanford Achievement Test, 9th edition on students who are deaf and hard of hearing. This study revealed that the majority of deaf and hard of hearing students scored basic or below basic levels on mathematics procedures and mathematics problem solving subtests. Additionally, Kelly and Gaustad (2007) examined a sample of deaf college students from NTID and found that “specific morphological competencies in English in addition to reading ability level are significantly related to mathematics performance” (34).

In addition to reading literacy other factors have been identified that contribute to the difficulty students who are deaf or hard of hearing face with critical thinking and problem solving in math. In a study of NTID students Mousley and Kelly (1998) found factors such as
building metacognitive skills, impulsivity, and linguistic difficulty contribute to difficulty in mathematics. Additionally, Mousley and Kelly found that students rushed through math problems too quickly and did not take the time to apply problem-solving techniques with mathematics.

As the findings from this study support, high levels of math proficiency may not be a factor of how well students who are deaf or hard of hearing perform in the postsecondary setting, particularly at the vocational/technical level. Characteristics other than math proficiency should be taken into consideration when advising students during the transition process.

**English Literacy**

In this study, the relationship between English literacy and postsecondary degree attainment by level of degree had interesting results. When considering the results by degree status we find that students scored higher on the passage comprehension and synonym/antonym subtests at the 2-year postsecondary level. However, looking at degree status at all levels on both the reading comprehension and synonym/antonym portion of the Woodcock Johnson III subtests, the majority of graduates scored below the average mean. In fact, students scored very low on the passage comprehension subtests at the vocational/technical level. It is important not to misinterpret this finding. While this sample of students scored low to very low on the reading portions of the WJIII subtests, this is not to imply reading is not an important factor. For this study average to above average reading skills is not a characteristic of this population. This finding is not a surprise. Literature documents that the average reading level of individuals who are deaf or hard of hearing is on or about the 4th grade (Holt, J.A., Traxler, C.B., & Allen, T.E., 1997; Gallaudet Research Institute, 1996). Even with low proficiency in reading students who are deaf or hard of hearing are still persisting through to graduation. In fact, research by Allen
(1994) found that two-thirds of students who are severely or profoundly deaf attend a postsecondary setting, but only one-fourth of these students read at or above a 5th grade level.

Research with students who are deaf and hard of hearing found heavy parental involvement, high parental expectations, being able to communicate with family members, early development of reading and writing skills, demanding middle and high school experiences, access to technology, and positive self-image to be characteristics of students who have strong academic literacy skills (Toscano, R., McKee, B., & Lepoutre, D., 2002). It is important to note that this study only analyzed postsecondary completers, it is unknown how this sample compares to non-completers, but one can only surmise that students who persist to completion have a high intrinsic motivation that helps them to overcome the barrier related to English proficiency.

**Academic Setting**

Finally, the majority of graduates in this study attended public school. Only about .4% of graduates in this sample had attended a residential school for the deaf. However, overall only 12.4% of students, both completers and non-completers, attended a residential school for the deaf. Residential schools for the Deaf have seen a steady decline in enrollment (Padden & Humphries, 1988) since PL 94-172 The Education for All Handicap Children Act was enacted in 1975. PL 94-142 was reauthorized as the Individuals with Disabilities Education Act (IDEA). This legislation requires all public schools to provide equal access to children with disabilities, education them in the “least restrictive environment.” Since many residential schools for the deaf have been closed or in jeopardy of being closed (Moores, 2009). It is important to recognize that many parents are choosing to mainstream their sons/daughters into the public school system rather than send them to residential schools for the deaf.
Limitations and Threats to Validity

Delimitations

The goal of this study was to explore the characteristics of postsecondary graduates who are deaf or hard of hearing. It was not the intention of this researcher to explore characteristics of students who do not succeed in the postsecondary setting. While knowing more about the reasons students do not succeed in the postsecondary setting is information that would be beneficial to the field, it was beyond the scope of this study.

Limitations

There were several limitations to this study. The primary limitation was the fact that the data used in this study were from an existing federal database that is housed at the NCES (National Center for Education Statistics). Therefore, the researcher in this study had no control over the sample that was collected or the types of questionnaires and assessments that were used to collect data from the sample. Also, the majority of the information was self-reported either by the parent or the student. This method resulted in difficulty in interpreting some of the data. For example, many students choose more than one mode of communication as their “primary” mode. Perhaps students were unsure about the meaning of “primary” mode of communication.

The researcher had no control over student responses or how the information was collected from students who are deaf or hard of hearing. The NLTS2 researchers indicated that interpreters were used with some of the students to collect information, but information about the credentials of the interpreters that were used is not available. Having an unqualified, non-certified interpreter could result in misunderstanding or misinterpretation of the content.

Another limitation was that data on the hearing status of parents was not collected. It would have been beneficial to be able to document the percentage of students who had parents
that are deaf. The researchers of the NLTS2 did gather information about whether or not the parents or guardians had a disability, but did not ask them to specify their disability. Finally, the students sampled in this study were only those who receive special education services. Some students who are deaf or hard of hearing, particularly those who are oral or hard of hearing, may not receive special education services.

**Threats to Validity**

Threats to validity were minimized in a variety of ways for both internal and external validity. Internal validity is when extraneous outside variables interfere with the accuracy of data. Eight extraneous variables are: *history, maturation, testing, instrumentation, statistical regression, selection, experimental mortality*, and *selection-maturation interaction* (Campbell, D. & Stanley, J., 1963). *History* and *maturation* may have had a minimal impact on the data collected since this was a longitudinal study. History and maturation may have had an impact on data because certain direct assessments, such as self-determination and self-concept, were administered in earlier waves of data collection, specifically waves one and two of the study. Student status on these variables may change with age and development experiences in postsecondary education.

Threats to external validity jeopardize generalization of the results. However, the NLTS2 designed this study to be able to generalize the results to the population of students that are represented in this sample. In order to generalize to the population, weights are applied using Deming’s algorithm (Deming, W. E., 1943). The goal was to use the following parameters to match the universe with the weighted sample (Javitz, H., & Wagner, M., 2003):

- Total number of students in the grades from which NTLS2 students were selected.
- Total number of students in the NLTS2-eligible grades by ethnicity (non-Hispanic
Caucasian, non-Hispanic African American, Hispanic, and other).

- Total number of students in the NLTS2-eligible grades by urban city (urban, suburban, or rural).

- Total number of students in the NLTS2-eligible grades by wealth (in four wealth categories defined by Orshansky percentiles).

- Total number of students in the NLTS2-eligible grades by region (Northeast, Central, South, and West/Southwest).

- Total number of students in the NLTS2-eligible grades by LEA size (very large, large, medium, and small). (p. 8)

A sophisticated stratified sampling procedure was implemented to ensure that the universe of LEAs was represented. According to the NLTS2 sampling plan (SRI, 2000), weights were developed. “Because LEAs have an unequal probability of being selected into the sample, depending on the stratum within which they fall, LEAs need to be weighted by the inverse of the stratum sampling fraction to create population estimates.” (p. 15)

### Recommendations for Future Research

Several recommendations can be made based on the significant findings from this study.

*Recommendations 1: Conduct further research on the characteristics of postsecondary graduates who are deaf or hard of hearing.* Further research is needed to identify characteristics of postsecondary graduates who are deaf or hard of hearing. Prior to the NLTS2 study, the last study that analyzed outcomes of postsecondary graduates who are deaf or hard of hearing was Schroedel and Geyer’s longitudinal study in 2000. It is recommended that further research be conducted, controlling for some of the limitations that were outlined in this chapter. These studies are critical to validating the findings from this current study.
Recommendation 2: Conduct a follow-up study of the NLTS2 to include wave 5 data.

As stated in chapter three, wave five was not available at the time this study was being conducted. It would be beneficial to the field to replicate this study using all five waves of the NLTS2. In addition, it is recommended that a follow-up study would be more explanatory in nature that would attempt to answer the question, “Among students who are deaf or hard of hearing, what is the relative contribution of demographic/student, family, psychological, and school related factors to postsecondary completion?”

Recommendation 3: Conduct further research to identify differences in characteristics of postsecondary graduate and non-graduate students. While this study did not focus on non-completers, it would be beneficial to the field to investigate whether characteristics of those who do not persist are in fact dissimilar to those who do persist through to graduation. Specifically, it would be of benefit to the field to investigate the psychological constructs, self-advocacy, self-concept, self-determination and friendship interaction to determination whether there are differences between graduates and non-graduates. It would also be of interest to investigate parental expectation and experience with deafness and levels of math literacy and English literacy.

Recommendation 4: Conduct further research related to minority students who are deaf or hard of hearing. The shift in racial/ethnic populations demands that postsecondary education strategies are viewed through a cultural lens to improve postsecondary outcomes among minority students. Comparing changes from 1980 to 2008 at postsecondary institutions, proportions of Caucasian students have declined from 80% to 66%, and the Hispanic population increased in proportion from 6% to 15%, while the African American population has remained about the
same at 12% (Aud, Fox, KewalRamani, & National Center for Education Statistics, 2010).

Further research is need for the recruitment and retention of minority student.

**Recommendation 5: Conduct further research related to African American students, class placement and the types of services they receive in both the secondary and postsecondary setting.**

As reported in the literature review of this study, African Americans are more likely to place in a lower academic class than Caucasian students (Holt & Allen, 1998). Using the NLTS2, further research should be conducted to see if this finding is still valid. In addition, Williamson (2004) reported in her dissertation study that the main predictive factor of success for African Americans students who are deaf and hard of hearing is parental support and expectation. An investigation of parental expectation by race is recommended to validate Williamson’s finding.

**Recommendation 6: Conduct further research on the gender gap of postsecondary students.** Females have outnumbered males in enrolling and participating in higher education. Females had a 6% increase in enrollment, while males only had a 2% increase in enrollment (Cook and Cordova, 2007). Research on how to close the gender gap is needed to provide institutions of higher education resources that would aid in the retention of male students who are deaf or hard of hearing. In addition, resources are needed that would provide support to males as they transition from a vocational/technical program to a 2-year community college program or 4-year university.

**Recommendation 7: Conduct further research on career attainments of postsecondary graduates.** Investigating career attainment among graduates who are deaf or hard of hearing is beneficial to document the benefit of postsecondary education. Wave 5 of the NLTS2 has gathered information such as number of months from graduation to employment, type of degree earned and type of employment obtained. Perhaps this group of graduates would be a sample to
study characteristics of students who are successful in their careers following completion of postsecondary programs.

Recommendation 8: Conduct further research on the role of service providers in supporting successful postsecondary educational attainment within students who are deaf or hard of hearing. Service providers play a key role in supporting students who are deaf or hard of hearing. It would benefit the field to investigate type and quality of services, such as vocational rehabilitation counselors, sign language interpreters, captionists, and tutors. It would be of interest to the field to know students’ perceptions of these service providers and whether they in fact made an impact on postsecondary attainment.

Conclusion

This study analyzed the relationship of postsecondary attainment defined as degree status and multiple categories of descriptive variables including, gender, race, math literacy, reading literacy, academic setting (public/residential), communication modality (sign language/oral speech), cochlear implant user, parental academic expectation, parental educational attainment, self-determination, self-concept, self-advocacy, and friendship interaction. All the variables analyzed had a statistical relationship with postsecondary attainment, and thereby provide insight about the types of students obtaining postsecondary degrees. The findings in this study can be summarized by saying the typical college graduate who is deaf or hard of hearing is a Caucasian male, public school graduate, who uses both sign language and speech to communicate, and scores low to average in math but has low English skills.

While the information gained from this research is helpful to document characteristics of successful postsecondary graduates, further research is needed. Additional research regarding factors of successful postsecondary graduates who are deaf or hard of hearing is needed to provide
educators and practitioners in the field with the information needed to develop tools and resources that would enhance the transition skills of students who are deaf or hard of hearing. Hopefully, the research gathered in this study will provide information to help inform transition curriculum development in the secondary setting.
BIBLIOGRAPHY


Newman, L. (personal communication, October 15, 2010).


APPENDICES

Appendix A: IRB Approval, University of Arkansas
Appendix B: IRB Approval, University of Arkansas at Little Rock
Appendix C: NCES Data Retrieval Approval for NLTS2
Appendix D: Permission from Author to Reproduce NLTS2 Timeline
Appendix E: List of Variables
February 13, 2012

MEMORANDUM

TO: Amy Hebert
Brent Williams

FROM: Ro Windwalker
IRB Coordinator

RE: New Protocol Approval

IRB Protocol #: 12-01-427

Protocol Title: Factors Affecting Postsecondary Educational Attainment of Students Who Are Deaf or Hard of Hearing

Review Type: EXEMPT

Approved Project Period: Start Date: 02/13/2012 Expiration Date: 01/29/2013

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form Continuing Review for IRB Approved Projects, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (http://vpred.uark.edu/210.php). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

If you wish to make any modifications in the approved protocol, you must seek approval prior to implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 210 Administration Building, 5-2208, or irb@uark.edu.
MEMORANDUM

TO: Amy N. Hebert, RHAB-UAF
Dr. Glenn Anderson, Counseling, Adult & Rehabilitation Education

CC: Dr. Elisabeth Sherwin, IRB Chair

FROM: Dan Shelton, Asst. Research Compliance Officer

DATE: May 23, 2011

RE: IRB Request for Exemption

Thank you for your recent Institutional Review Board Request for Exemption (Protocol # 11-154) titled “Factors Affecting Postsecondary Educational Attainment of Students Who Are Deaf or Hard of Hearing.” We have reviewed this request and find that it meets the IRB’s criteria for protection of human participants. Your project has IRB approval from today until May 22, 2012 and you are free to proceed with data collection.

Please note: Your CITI training certification expires June 24, 2011, which is before the anticipated end date of your study. You have the responsibility of completing the on-line refresher course and notifying the Research Compliance Office when you have completed it.

If this study continues unchanged for more than one year, you will need to submit a Request for Continuing Review. If this study continues for more than one year and there are changes to the research design or data that is collected, you will need to submit a Request for Review of Modification or Amendment to Approved Research form.

** This message is a reminder that you may begin your research project.

Best of luck with your study.

Research Compliance Office – Administration North, 301
2801 South University Little Rock, Arkansas 72204
(O) 501.569.8687 (F) 501.569.3039
www.ualr.edu/irb

139
Dear Jim Vander Putten,

Your request to amend your License for additional restricted-use data has been approved. We will be mailing the data to you in the next few business days. Keep a copy of this email as part of your License file.

These additional data require the same protection as the original licensed data, as the same confidentiality laws and restrictions apply.

Any reports or other pre-publication documents that use or contain IES restricted-use data need to be reviewed by the IES Data Security office prior to their dissemination outside the licensed research project staff. Please send these reports to the email address below.

If you have any questions, please contact us.

IES Data Security Office
Department of Education/IES/NCES
1990 K. Street, NW, Room 9060
Washington, DC 20006
202-502-7307

IES Data Security Office
APPENDIX D-Timeline Permission

To Lyn

To Lyn

To Lyn

To Lyn

To Lyn

To Lynn Newman

Hi Amy, You definitely may use the NLTS2 timeline in your dissertation. What is the focus of your dissertation work? Lynn

Lynn Newman, Ed.D.
Senior Education Researcher
SRI International

Fri, Oct 15, 2010 at 1:57 PM

Fri, Oct 15, 2010 at 1:02 PM

Fri, Oct 15, 2010 at 11:02:37 AM

Thu, Oct 14, 2010 at 2:30 PM

[Quote text hidden]
## APPENDIX E-List of Variables

Table 1. List of Study Variables

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational Certificate</td>
<td>Youth has received a vocational certificate</td>
</tr>
<tr>
<td>2-year degree</td>
<td>Youth has received a diploma from a 2-yr college</td>
</tr>
<tr>
<td>4-year degree</td>
<td>Youth has received a diploma from a 4-yr college</td>
</tr>
<tr>
<td>Any Postsecondary degree or certificate</td>
<td>Youth has received a diploma or certificate from any postsecondary institution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>Dummy variable (coded 1=females and 0=males)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>Dummy variable (coded 1 for Caucasian)</td>
</tr>
<tr>
<td>African American</td>
<td>Dummy variable (coded 1 for African American)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>Dummy variable (coded 1 for Hispanic)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>Dummy variable (coded 1 for Asian/Pacific Islander)</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>Dummy variable (coded 1 for American Indian/Alaska Native)</td>
</tr>
<tr>
<td>Other/multiple</td>
<td>Dummy variable (coded 1 for Other/multiple)</td>
</tr>
<tr>
<td>Cochlear</td>
<td>Dummy variable (coded 1=yes, 0=no)</td>
</tr>
<tr>
<td>Sign language</td>
<td>Dummy variable (coded 1 for sign language user)</td>
</tr>
<tr>
<td>Lip reading</td>
<td>Dummy variable (coded 1 for lip reading)</td>
</tr>
<tr>
<td>Cued Speech</td>
<td>Dummy variable (coded 1 for cued speech)</td>
</tr>
<tr>
<td>Oral Speech</td>
<td>Dummy variable (coded 1 for oral speech)</td>
</tr>
<tr>
<td>Something Else</td>
<td>Dummy variable (coded 1 if student used something else)</td>
</tr>
<tr>
<td>American Sign Language</td>
<td>Dummy variable (coded 1 for ASL)</td>
</tr>
<tr>
<td>Signed English</td>
<td>Dummy variable (coded 1 for Signed English)</td>
</tr>
<tr>
<td>Other Sign System</td>
<td>Dummy variable (coded 1 for other sign system)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parent Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parental Academic Expectations</td>
<td>Likelihood that youth will attend postsecondary school (1=definitely will, 2=probably will, 3=probably won’t, 4=definitely won’t)</td>
</tr>
<tr>
<td>Parental Educational Attainment</td>
<td>Highest grade [respondent, parent, or legal guardian] finished in school</td>
</tr>
<tr>
<td></td>
<td>1 8th grade or less (includes no school)</td>
</tr>
<tr>
<td></td>
<td>2 9th grade or above, not a high school graduate</td>
</tr>
<tr>
<td></td>
<td>3 High school graduate or GED</td>
</tr>
<tr>
<td></td>
<td>4 Post high school education no degree</td>
</tr>
<tr>
<td></td>
<td>5 Vocational-technical</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Psychological Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Concept</td>
<td>Summated scale measuring self-concept (ranging from 5 to 20)</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Self-Determination</td>
<td>Summated scale measuring self-determination (ranging from 5 to 20)</td>
</tr>
<tr>
<td>Self-Advocacy</td>
<td>Summated scale measuring self-advocacy (ranging from 5 to 20)</td>
</tr>
<tr>
<td>Friendship Interaction</td>
<td>Summated scale measuring friendship interaction (ranging from 5 to 20)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Literacy</td>
<td>Standardized composite test score</td>
</tr>
<tr>
<td>Reading Literacy</td>
<td>Standardized composite test score</td>
</tr>
<tr>
<td>Academic Setting</td>
<td>Description of this school (1=regular school serves variety of students, 2=school serves only students with disabilities), A2_01=public school, A2_02=private school, A2_03=residential school (0=No, 1=Yes)</td>
</tr>
</tbody>
</table>