2016

Determinants of Obesity Among Deaf and Hard of Hearing Adults

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
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2016

Abstract

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by

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MS, Rochester Institute of Technology, 2005

BS, Rochester Institute of Technology, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

Trends of obesity increased over the last 3 decades with the obesity rate doubling from 1980 to 2010. People with disability are more likely to experience health disparities including obesity compared to the general population. Yet research on the determinants of obesity such as self-efficacy, hearing levels, and deaf acculturation styles among those who are deaf or hard of hearing (HoH) is limited. This cross-sectional study, using the social cognitive theory framework, examined BMI and self-efficacy differences between deaf/HoH adults and hearing adults, aged 20 years and older. This study also examined the associations between BMI or self-efficacy and factors of hearing level or deaf acculturation style using the Health Belief and Deaf Acculturation Scale surveys, respectively. A total of 241 participants from Gallaudet University participated in this study. Independent sample *t* tests and multiple linear regressions were used. There were no differences in BMI ($t = -0.285$, $p = 0.777$) and nutritional and physical activity self-efficacy ($t = -0.962$, $p = 0.338$ and $t = 0.766$, $p = 0.446$) between deaf/HoH adults and hearing adults. Among deaf/HoH adults, there were no associations between obesity as well as self-efficacy and factors of average hearing level and deaf acculturation style. This study offers evidence to the literature regarding the relationships between obesity or self-efficacy and factors of average hearing level or deaf acculturation styles among deaf/HoH adults. In addition, this study provided implications for social change as a basis for further research and reducing obesity through adopting current obesity programs while ensuring communication and information access for all deaf/HoH adults with varying levels of hearing and acculturation styles.

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Dedication

I wish to dedicate this dissertation to the memory of my sign language interpreter, Mary Lombard. Without her confidence in my academic abilities and her words of telling me that I would go far academically and become a doctor one day, this academic endeavor would not have occurred. Mrs. Lombard, while you may not be here to see this day, I know that you knew this would happen before I did.

I also want to thank you, mom, for being my biggest supporter. You always encouraged me to be the best I can be. When I first said I was going to pursue my PhD, you threw a party. Since that day, you always offered a positive attitude and supported me through my frustrations, tears, and joys. David Carter Jr., my significant other, you and I started our journey at the same time I started my doctoral studies. Thank you for your patience and support when my schooling commitments came first. More importantly, thank you for believing in me and encouraging me to finish my schooling even during the times I wanted to quit. Finally, thank you to my family and friends who made my journey easier by being there for me and offering me opportunities to maintain a balanced life of work and play.

Acknowledgments

It is with great pleasure that I give my sincerest thanks to my chair Dr. Nicoletta Alexander, my committee member Dr. Scott McDoniel, and my university research reviewer Dr. Gudeta Fufaa for their dedication and support in reviewing my proposal and dissertation. I would also like to give a special thank you to Dr. Regina Nuzzo for offering her statistical expertise and guidance on my dissertation.

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Chapter 1: Introduction

Introduction

With obesity trends increasing in the last three decades and evidence of disparities of obesity among subgroups, particularly those with a disability, more research needed to be done to understand the severity of these disparities. Understanding the severity of obesity disparities will guide researchers in implementing obesity intervention programs that are tailored to the population of need. The purpose of this study was to examine the obesity prevalence and nutrition and physical activity behaviors among deaf and hard of hearing adults. Assessing the obesity prevalence and the social cognitive theoretical constructs of nutritional and physical activity behaviors has important implications for public health.

In this chapter, an overview of the proposed dissertation study is described. A background of the study, a summary of the research literature and gaps, and a description of the necessity of the study will be explained. Following after identifying the gaps and describing the necessity of the study, the problem statement, the purpose of the study, and research questions and hypotheses addressing the study topic will be discussed. How the study topic will be addressed is then discussed within the sections of the theoretical framework of the study, nature of the study, definitions, assumptions, and scope and delimitations. The chapter then concludes with the study's limitations and significance.

Background of the Study

In the last three decades, obesity threatened the nation with increasing trends. From 1980 to 2010, the rate of obesity for adults nearly tripled, and United States is in

the lead (Harvard School of Public Health [HSPH], 2013; Ogden & Carroll, 2010). Among adults aged 20 years or older, 69.0% of them are classified as overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014).

Despite these concerning statistics, certain groups, such as people with a disability, are more likely to experience health disparities including obesity compared to the general population (Barnett, McKee, Smith, & Pearson, 2011; Healthy People, 2014; Pollard, Dean, O'Hearn, & Haynes, 2009). However, as described in depth in Chapter 2: Literature Review, there is a lack of clear operational definition of disability. Due to the inability to hear, researchers classify deaf and hard of hearing people as people with a disability even though the majority of them are without mobility limitations or intellectual or learning disabilities. But, there is a high chance that deaf and hard of hearing people are not included in studies indicating that people with disability experience health disparities for reasons explained in depth in Chapter 2: Literature Review.

Without an understanding of the obesity prevalence among the deaf and hard of hearing adults, this particular population may be suffering from greater health disparities compared to those without a disability. Therefore, this study increases researchers' comprehension of the severity of obesity prevalence and the need for obesity intervention within the population of deaf and hard of hearing adults. The positive social change implications include an original contribution to research in clarifying the operational definition of deaf and hard of hearing adults while using specific levels of hearing loss and deaf acculturation styles. Further, it also includes knowledge useful for those who

need guidance in improving the health of deaf and hard of hearing adults when developing and implementing preventive measures. Long-term results may include a decrease in the obesity prevalence as well as an increased knowledge of nutrition and physical activity behaviors in maintaining a healthy weight among deaf and hard of hearing adults.

Research Literature and Gaps

Obesity is a complex disease, which involves an excessive amount of body fat from a caloric imbalance of nutrition (calories intake) and physical activity (calories expenditure) (Centers for Disease Control and Prevention [CDC], 2014b). Beyond weighing more than what is considered healthy for one's height, obesity is a health risk for the general population. As one gains weight, one's risk for obesity-related conditions increases. Obesity-related conditions or health risks include heart disease, diabetes, stroke, and some cancers including, but not limited to breast cancer, colon cancer, and kidney cancer (Centers for Disease Control and Prevention [CDC], 2014c).

As described earlier, the overweight and obesity prevalence among adults aged 20 years or older in the United States is 69.0% (Ogden et al., 2014). Each state has an obesity prevalence of at least 20% (Centers for Disease Control and Prevention [CDC], 2014c). If trends continue, it is predicted that the obesity prevalence will continue to increase, such that each state will have an obesity prevalence of at least 44% by 2030 (Centers for Disease Control and Prevention [CDC], 2014c). Among those who have a disability, the risk of obesity is higher than the general population.

Obesity is reported as the leading secondary condition after listing disability as a primary condition by people with disabilities (Institute of Medicine, 2007). Researchers who examined the obesity prevalence among adults with a disability compared to those without a disability indicated that the obesity prevalence was about 10% greater among those with a disability compared to those without a disability (Anderson, Wiener, Khatutsky, & Armour, 2013; Froehlich-Grobe, Lee, & Washburn, 2013; Weil et al., 2002). However, of these studies addressing the obesity prevalence among adults with a disability, only Weil et al. (2002) mentioned and included deaf and hard of hearing adults in the study.

Despite an inclusion of deaf and hard of hearing adults in the Weil et al. (2002) study, the operational definition of deaf and hard of hearing was not clear. Deaf and hard of hearing was defined as having difficulty hearing normal conversations or using a hearing aid (Weil et al., 2002). While this definition may appear sufficient, the study does not provide descriptive statistics on the participants' level of hearing loss. Deaf and hard of hearing adults have varying degrees of hearing loss that can range from those with mild hearing loss (little to some trouble hearing normal conversations) to those with profound hearing loss (inability of hearing normal conversations or using hearing aids). Further, the mean age of deaf and hard of hearing participants in this study was 62.5 years old (Weil et al., 2002). It gives reason to speculate a bias in the study with a majority of the participants who may have been elderly adults with mild hearing loss.

In another study, a group of authors conducted a study to measure the obesity prevalence among adults who are deaf sign language users in Rochester, New York

(Barnett, Klein, et al., 2011). In this study, the prevalence of overweight and obesity were greater among deaf adults compared to adults without a disability (Barnett, Klein, et al., 2011). However, the comparisons were made among deaf adults who participated in the authors' study during 2008 and among adults without a disability who participated in the Rochester telephone Behavioral Risk Factors Surveillance System (BRFSS) survey during 2006. By comparing data from two different years, it presents a potential threat to internal validity. Further, the authors did not include descriptive statistics on the participants' hearing levels. Similar to Weil et al.'s (2002) study, it is not fully understood who the participants are, and whether obesity is more prevalent among those with certain hearing levels. As a result, without an understanding of the characteristics of the deaf adults, interpretation and generalizations of the obesity prevalence among deaf and hard of hearing adults are limited.

While deaf and hard of hearing adults have varying degrees of hearing loss, they also have different acculturation styles depending on their interactions and behaviors within a culture (D. Maxwell-McCaw & Zea, 2011). In examining the interrelations between acculturation styles and self-esteem as well as satisfaction with life, deaf and hard of hearing people with bicultural, deaf, and hearing acculturation styles have a greater self-esteem and satisfaction of life compared to those with marginal acculturation style (Hintermair, 2008). However, at the time of writing, associations of acculturation styles and one's health behaviors, including obesity or nutrition and physical activity have not been studied, particularly in the United States.

Necessity of the Study

Within the research literature component of this chapter, it was demonstrated that studies addressing the obesity prevalence and the risk of obesity among people with disabilities, specifically deaf and hard of hearing people, compared to the general population are limited. Despite studies of the prevalence of obesity among deaf and hard of hearing adults, a review of the literature revealed a gap in the research of the determinants of the prevalence of obesity among deaf and hard of hearing adults. These determinants include nutritional and physical activity behaviors, hearing levels, and deaf acculturation styles.

This cross-sectional study focused on the differences in the obesity prevalence between deaf and hard of hearing adults and hearing adults. This study also focused on the factors of nutritional and physical activity behaviors associated with obesity among deaf and hard of hearing adults. Investigation of and understanding the obesity prevalence and nutritional and physical activity behaviors while accounting for hearing levels and deaf acculturation styles may reduce obesity disparities among deaf and hard of hearing adults.

Problem Statement

Obesity trends in the last three decades have continued to increase among the United States population, which is placing the population at risk for associated morbidity. However, evidence from studies indicated disparities in obesity between those with a disability and those without a disability in which those with a disability are experiencing

greater obesity prevalence (Anderson et al., 2013; Froehlich-Grobe et al., 2013; Weil et al., 2002). As a result, people with disabilities are at a greater risk of morbidity.

People with a disability are defined with various meanings, and include people with mobility limitations, intellectual or learning disabilities, and people with limited English proficiency (Barnett, McKee, et al., 2011; Healthy People, 2014; Pollard et al., 2009). Researchers classify deaf and hard of hearing people as people with a disability due to the inability to hear, but the majority of them are not with mobility limitations or intellectual or learning disabilities. At the time of writing, only two published studies addressed the obesity prevalence among deaf and hard of hearing adults (Barnett, Klein, et al., 2011; Weil et al., 2002). Both studies indicated greater obesity prevalence among deaf and hard of hearing adults compared to adults who did not have a disability (Barnett, Klein, et al., 2011; Weil et al., 2002). However, in both studies, operational definitions using hearing levels and deaf acculturation styles are lacking. As a result, an understanding of the characteristics of the deaf and hard of hearing adults who participated in both studies are limited, which then limits interpretation and generalization of the results.

There are gaps and limited research in knowledge about the obesity prevalence and its determinants such as nutritional and physical activity behaviors among deaf and hard of hearing adults, aged 20 years and older. Without understanding the obesity prevalence of the deaf and hard of hearing adults, as well as their nutritional and physical activity behaviors, appropriate and adequate interventions cannot be tailored to this population. Therefore, this study addressed gaps in the current research literature about

obesity as well as the nutritional and physical activity behaviors among deaf and hard of hearing adults. To address the gaps, the researcher compared the obesity prevalence between hearing adults and deaf and hard of hearing adults. This was in addition to examining the contributing factors of hearing levels and deaf acculturation style to obesity among deaf and hard of hearing adults. Further, the researcher compared the social cognitive theoretical construct of self-efficacy between hearing adults and deaf and hard of hearing adults. In addition, the researcher examined the contributing factors of hearing levels and deaf acculturation style to the social cognitive theoretical construct of self-efficacy among deaf and hard of hearing adults.

Purpose

The purpose of this study was to examine the obesity prevalence and the nutritional and physical activity behaviors among deaf and hard of hearing adults, aged 20 years and older. To address the research question, the approach used a quantitative research design. The variables for this study included independent variables of level of hearing loss and deaf acculturation styles, and dependent variables of Body Mass Index (BMI) and nutritional and physical activity behaviors using social cognitive theory constructs. Covariates for this study included age, sex, and race/ethnicity. Assessments of responses from surveys were used to measure obesity prevalence and nutritional and physical activity behaviors that are associated with social cognitive theory constructs among deaf and hard of hearing adults. Factors of level of hearing loss and deaf acculturation styles were assessed to examine associations between these factors and

obesity prevalence or nutritional and physical activity self-efficacy while controlling for the covariates.

Research Questions and Hypotheses

RQ1: In individuals aged 20 and older, are there differences in obesity when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss)?

Hypothesis 1

$H1_0$: In individuals aged 20 and older, there is no difference in obesity as measured by Body Mass Index (BMI) when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss) as measured by average of hearing loss.

$H1_A$: In individuals aged 20 and older, there are differences in obesity as measured by BMI when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss) as measured by average of hearing loss.

RQ2: In individuals aged 20 and older, is level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 2

$H2_0$: In individuals aged 20 and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is not significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H2_A$: In individuals aged 20 and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ3: In individuals aged 20 years old and older who are deaf and hard of hearing, is acculturation style (hearing acculturated, marginal, deaf acculturated, or bicultural) significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 3

$H3_0$: In individuals aged 20 years old or older who are deaf or hard of hearing (as measured by levels of hearing loss), acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural), as measured by Deaf Acculturation Scale (DAS), is not significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H3_A$: In individuals aged 20 years old or older who are deaf or hard of hearing, (as measured by levels of hearing loss) acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural), as measured by DAS, is significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ4: In individuals aged 20 years old and older, are there differences in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss)?

Hypothesis 4

$H4_0$: In individuals aged 20 years and older, there is no difference in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by the Health Beliefs Survey (HBS) when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss).

$H4_A$: In individuals aged 20 years and older, there is a difference in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by the HBS when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss).

RQ5: In individuals aged 20 and older, is level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a

healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 5

$H5_0$: In individuals aged 20 years and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is not significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors as measured by the HBS in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H5_A$: In individuals aged 20 years and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors as measured by HBS in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ6: In individuals aged 20 years old and older, is acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 6

$H6_0$: In individuals aged 20 years old and older, acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) as measured by DAS is not significantly associated with the social cognitive theoretical constructs of

nutritional and physical activity behaviors in maintaining a healthy weight as measured by HBS after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H6_A$: In individuals aged 20 years old and older, acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) as measured by DAS is significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by HBS after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

Theoretical Framework

The theoretical framework of the social cognitive theory (SCT), originally known as the social learning theory by Albert Bandura, was utilized in this research. How people acquire and maintain certain behavioral patterns is explained within this theory (Bandura, 1997). Within this theoretical framework, there is an emphasis on the reciprocal determinism in the interaction of three factors: personal, behavioral, and environmental (shown in Figure 1) that influence how people behave (Bandura, 1997; McAlister, Perry, Parcel, Rimer, & Viswanath, 2008). Thus, any changes to one of the three factors can lead to an alteration of one's health behaviors (McAlister et al., 2008). The core determinants or constructs of the SCT, described in depth in Chapter 2: Literature Review, indicated that one's future behavior is affected by a person's behavior and cognition. As a result, the SCT offers guidance in designing and implementing intervention programs through an evaluation of behavioral changes based on environmental, behavioral, and personal factors (Bandura, 1997).

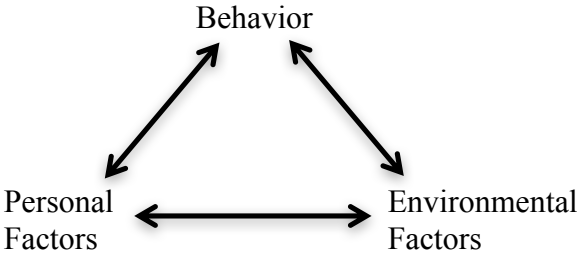

Figure 1. *Theoretical Framework of social cognitive theory*

In studying nutritional and physical activity behaviors among various populations, the application of the SCT is useful. Constructs of the SCT have been consistently related to nutritional and physical activity behaviors. These constructs are self-efficacy (individual's perception of one's ability of exercising control over one's health habits), outcome expectations (individual's belief about the negative and positive consequences for different health habits), and self-regulation (individual's control of oneself through self-monitoring (Anderson, Winett, & Wojcik, 2007; McAlister et al., 2008; Netz & Raviv, 2004; Patterson, Meyer, Beaujean, & Bowden, 2014; Petosa, Suminski, & Hortz, 2003). Further, these studies, as described in depth in Chapter 2: Literature Review, have demonstrated that those with higher self-efficacy, outcome expectations, and self-regulation are more likely to engage in positive behaviors. Thus, it indicates the importance of developing interventions that address self-efficacy, outcome expectations, and self-regulation in nutritional and physical activity behaviors. In understanding the determinants of monitoring and maintaining a healthy lifestyle (nutrition and physical activity) among deaf and hard of hearing adults, researchers may be able to construct effective dietary and physical activity interventions.

Nature of the Study

Research Approach

The nature of this study was a quantitative research. More specifically, this study was a cross-sectional, comparative study. Since the participants are categorized based on the exposure of interest, which were obesity and nutritional and physical activity behaviors in this case, a cross-sectional observational study was appropriate for this research (Field, 2013). In addition, cross-sectional studies are also useful for answering research questions of comparisons between groups (Field, 2013). It is also consistent with understanding the prevalence of a disease as well as understanding the behaviors that contribute to obesity (e.g. nutrition and physical activity) while utilizing an instrument (e.g. survey). Key independent variables were levels of hearing loss and deaf acculturation style. Key dependent variables were BMI scores and Health Belief Survey (HBS) scores for the social cognitive theoretical (SCT) constructs of nutritional self-efficacy and physical activity self-efficacy. The HBS scores for the SCT constructs were derived from scores of one's nutritional and physical activity behaviors. Key covariates were age at diagnosis, age at time of survey, sex, and race/ethnicity.

Sampling and Data Analysis

The target population was students and employees at Gallaudet University in Washington D.C. who are United States citizens. Participants in the study included both hearing and deaf and hard of hearing adults, aged 20 years and older. The researcher randomly selected each participant, and provided each participant an opportunity to complete the survey questionnaire.

The survey questionnaire for hearing participants consisted of demographic questions and questions from the Health Beliefs Survey. For the deaf and hard of hearing participants, the survey questionnaire was the same as the hearing participants. However, these participants received an additional set of questions from the Deaf Acculturation Scale survey. Participants were invited to participate in the survey via SurveyMonkey to complete within a specified timeframe. The researcher extracted results from the SurveyMoneky into Microsoft Excel and then exported it into the statistical analysis software, IBM SPSS Statistics 21, after stripping any identifying information for statistical analyses. All electronic data were and still are password protected. A more detailed explanation of the materials and methods of this dissertation are in Chapter 3: Methodology.

Definitions

Below are definitions of the independent variables, dependent variables, and covariates. Details on coding or classifications of these variables are in Chapter 3: Methodology.

Bicultural: one of the four Deaf Acculturation Styles, which describes a deaf and hard of hearing person who is acculturated to deaf culture and hearing culture (D. Maxwell-McCaw & Zea, 2011).

Body Mass Index (BMI): a number calculated from a person's height and weight to indicate the body fatness of a person. BMI is calculated from the weight in pounds divided by the square of the height in inches and multiplied by the number 703 (Centers for Disease Control and Prevention [CDC], 2014b).

Deaf Acculturated: one of the four Deaf Acculturation Styles, which describes a deaf and hard of hearing person who is acculturated to deaf culture (D. Maxwell-McCaw & Zea, 2011).

Deaf Acculturation Style: a measure of cultural identity for the deaf and hard of hearing population. Classifications are hearing acculturated, marginal, deaf acculturated, and bicultural (D. Maxwell-McCaw & Zea, 2011).

Deaf and hard of hearing: hearing levels of mild (26 to 40 dB) to profound (91+) in one or both ears ((DeafTEC, n.d.; National Association for the Deaf [NAD], n.d.).

Hearing Acculturated: one of the four Deaf Acculturation Styles, which describes a deaf and hard of hearing person who is acculturated to hearing culture (D. Maxwell-McCaw & Zea, 2011).

Levels of Hearing Loss: classification of hearing loss are measured in decibels (dB) in which normal is -10 to 25 dB, mild is 26 to 40 dB, moderate is 41 to 70 dB, severe is 71 to 90 dB, and profound is 91+ dB (Clark, 1981; Spring Valley Hearing Center, 2014).

Marginal: one of the four Deaf Acculturation Styles, which describes a deaf and hard of hearing person who is neither acculturated to deaf culture or hearing culture (D. Maxwell-McCaw & Zea, 2011).

Obesity: being classified as overweight or obese with a Body Mass Index (BMI) of 25.0 to 29.9 or 30 or higher, respectively (Centers for Disease Control and Prevention [CDC], 2014b; Ogden et al., 2014).

Assumptions

Since obesity is a significant problem in the United States, and there is limited research on obesity among the deaf and hard of hearing population, there was an assumption that the participants who completed the questionnaire answered honestly and completely to the best of their ability. In addition, it was assumed that self-report of respondent's height, weight, and levels of hearing loss is accurate with the assumption that participants were aware and answered honestly. Otherwise, the reporting of BMI will be either underreported or overreported depending on their sex, ethnicity, and education (Wen & Kowalski-Jones, 2012). Further, it was also assumed that the data collection took place as defined in the study, participants are students or employees at Gallaudet University, and participants were willing and able to take the survey in English upon reading the electronic notice of informed consent.

Scope and Delimitations

A delimitation of this study was to include only those who are students or employees of Gallaudet University aged 20 years or older. As described in depth in Chapter 2: Literature Review, an accurate count and recruitment of deaf and hard of hearing adults is challenging. Gallaudet University is a university that primarily serves deaf and hard of hearing students, and employs deaf and hard of hearing adults. Not only does Gallaudet University serve and employ deaf and hard of hearing adults, but hearing adults as well. A second delimitation of this study was that this analysis included only those who have some college education or have a college degree. Given that the participants are a part of Gallaudet University, it is by nature that these participants are

students obtaining their college education or employees who are extremely likely to have a college degree. In addition, the survey was offered in English instead of American Sign Language (ASL), a native language or the preferred language over English for some participants. Therefore, those who have some college education or a college degree are more likely willing and capable of answering the questionnaire in English. As a result, generalizations are limited to those who are deaf and hard of hearing with some college education or a college degree.

Limitations

Threats to internal validity are considered to be limitations of the study (Creswell, 2009). There may be inaccurate reporting for BMI and levels of hearing loss. Height and weight used for calculating the BMI were self-reported. In addition, the level of hearing loss was also self-reported based on recall of the participants' last test, which may vary from recent to years before the administration of the survey. In other words, there may be recall bias of the level of hearing loss within this study. Given that the questionnaire included questions of recalling nutritional and physical activity behaviors, recall bias for these questions may be present in this study. Further, there is a chance of prevarication in which the individual may have knowingly reported false information or felt ashamed to report accurately. One additional limitation with regard to the questionnaire was offering the survey in English, a language that may not be the participants' native language or preferred language of American Sign Language. Therefore, the questions may have been answered based on their best guess or interpretation of the question. Another limitation of the study was the methodology of simple random sampling which depended on the

participants' willingness to respond to the survey. Depending on the characteristics of those who responded to the survey, the results of the study may not be generalizable to the population of deaf and hard of hearing adults who have some college experience or are college educated. Finally, the researcher is a member of Gallaudet University, which may bias the study even if the researcher attempted to take all precautions in reducing bias in the study.

Significance

Evaluating the context of disparities and research on understanding the United States population need to happen, according to Healthy People (2014). Researchers often interpret disparities as racial or ethnic, but there are other dimensions of disparities that exist such as sex, sexual identity, age, disability, socioeconomic status, and geographic location (Healthy People, 2014). It is these reasons that Healthy People 2020 developed objectives or health measures that will guide stakeholders or health professionals on its progress towards reducing or eliminating disparities (Healthy People, 2014).

According to Barnett, McKee et al. (2011) and National Council on Disability (2009), people with disabilities are more likely to be obese compared to people without disabilities. However, people with disabilities include many forms of disabilities such as mobility, hearing, and visual. Research on subgroups of people with disabilities, particularly deaf and hard of hearing, are not typically conducted. In the rare instance that it occurs, the operational definition of hearing loss or levels of hearing loss is ambiguous. Further, deaf and hard of hearing adults are often disregarded from public health surveillance (Barnett, Klein, et al., 2011). As a result, this research makes an

original contribution to clarifying the operational definition of deaf and hard of hearing using levels of hearing loss and deaf acculturation styles. This research increases and advances the knowledge of the severity of obesity prevalence based on the clarified operational definition of deaf and hard of hearing. In addition, it includes knowledge useful for those who need guidance in improving the health of deaf and hard of hearing adults when developing and implementing preventive measures. Long-term results may include a decrease in the obesity prevalence as well as an increased knowledge of nutrition and physical activity behaviors in maintaining a healthy weight among deaf and hard of hearing adults.

Summary

In Chapter 1, an overview of the dissertation study was described. The chapter began with an introduction of the study including a description of the topic of the study, why the study needed to be conducted, and potential positive social change implications of the study. Following after the introduction, a brief background of the study was then discussed with a summary of the current literature, the gaps in the literature related to the study topic, and an explanation on why the study was needed. With the gaps identified, the problem statement, purpose of the study, and research questions and hypotheses were then described. To clarify how the study would be addressed, the theoretical framework, nature of study, definitions, assumptions, scope and delimitations were explained. The chapter concluded with the study's limitations and significance. In Chapter 2, the literature search strategy, theoretical framework, and literature review of the obesity

prevalence among United States adults, United States adults with a disability, and United States adults who are deaf and hard of hearing will be discussed.

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Chapter 2: Literature Review

Introduction

Research on obesity prevalence and nutritional and physical activity behaviors among deaf and hard of hearing adults is limited. Among current research on the deaf and hard of hearing population with respect to obesity, disparities are present when comparing to those who are not deaf or hard of hearing. In other words, obesity prevalence is greater among deaf and hard of hearing adults. However, there was a lack of operational definitions for the deaf and hard of hearing as well as their use of communication (e.g. fluency of American Sign Language (ASL), fluency of lip reading, and fluency of spoken or written English), which increases difficulties in interpreting and generalizing the results. For example, Barnett Klein et al. (2011) conducted a study in examining the inequities of health among deaf adults who use ASL. Yet, it is not fully understood whether the researchers evaluated the participants' use of ASL or use of ASL was self reported by the participants. Weil et al. (2002) also examined the prevalence of obesity among those who have a physical disability including those who had a hearing loss. However, hearing loss was defined as "difficulty hearing normal conversations or uses hearing aid" (Weil et al., 2002, p. 1265). With this definition, hearing classifications are not used and the scale of hearing loss is unknown. Despite some understanding of the obesity prevalence among deaf and hard of hearing adults, there has not been any published research on the nutritional and physical activity behaviors among deaf and hard of hearing adults in the United States. Thus, the purpose of this study was to examine the obesity prevalence and the nutritional and physical activity behaviors among deaf and

hard of hearing adults, aged 20 years and older, in the United States with clear operational definitions of hearing loss classifications and acculturated style.

Within this literature review, evidence is provided for the need of studying the obesity prevalence as well as the nutritional and physical activity behaviors among deaf and hard of hearing adults. In other words, it "provides a framework for establishing the importance of the study as well as a benchmark for comparing the results with other findings" (Creswell, 2009, p. 25). Thus, the aim of this chapter is to provide a review of the obesity prevalence among the deaf and hard of hearing adult population, aged 20 years and older, in the United States. Beginning with the theoretical framework of social cognitive theory (SCT), this section will describe how the SCT will be applied to the study. Next, the literature review will introduce the definitions of obesity, disability, and deaf and hard of hearing. Following after, an overview of the prevalence of obesity among adults in the United States is discussed. Subsequently, an overview of the prevalence of obesity among adults with a disability and an overview the prevalence of obesity among deaf and hard of hearing adults in the United States are discussed. This section will conclude with a discussion of the gaps in research associated with obesity among deaf and hard of hearing adults. The concluding discussion will warrant the need for an additional study among deaf and hard of hearing adults regarding associations between obesity and hearing levels or deaf acculturation styles and associations between obesity and the nutritional and physical activity behaviors.

Literature Search Strategy

A search of the literature was conducted using the following databases: CINAHL, MEDLINE, PubMed, ProQuest, and ScienceDirect. In addition, the Google Scholar search engine was used. Combinations of the following key words and phrases in no particular order were used in the databases: *obesity, obesity disparities, implications of obesity, deaf, hard of hearing, hearing disability, disability, disabilities, hearing loss, hearing impaired, prevalence of obesity, obesity prevalence, communication modalities, and acculturation*. Due to limited published research on the obesity prevalence among deaf and hard of hearing adults, articles that were peer-reviewed and published between 1995 and 2015 were utilized for the literature review.

Theoretical Framework

Social cognitive theory (SCT), originally known as social learning theory by Albert Bandura, is the theoretical framework used in this research. How people acquire and maintain certain behavioral patterns is explained within this theory based on an emphasis on the reciprocal determinism in the interaction of factors (Bandura, 1997; McAlister et al., 2008). The dynamic interplay of the three factors: personal, behavioral, and environmental influence human behavior or how people acquire and maintain certain behavioral patterns, as shown in Figure 2 (Bandura, 1997; McAlister et al., 2008).

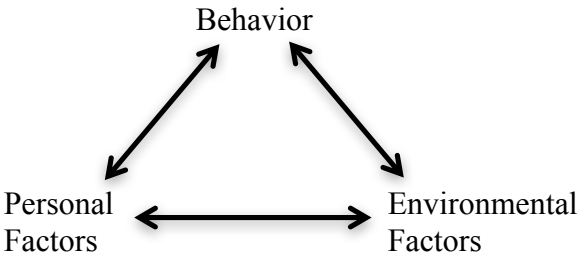

Figure 2. *Theoretical Framework of social cognitive theory*

To describe in depth, "the core determinants include *knowledge* of health risks and benefits of different health practices, *perceived self-efficacy* that one can exercise control over one's health habits, *outcome expectations* about the expected costs and benefits for different health habits, the health *goals* people set for themselves and the concrete plans and strategies for realizing them, and the *perceived facilitators* and social and structural *impediments* to the changes they seek" (Bandura, 2004, p. 144). In other words, the emphasis of the SCT is that one's future behavior is affected by a person's behavior and cognition. Thus, changes or differences in any of the three factors can alter one's health behaviors(Klohe-Lehman et al., 2006; McAlister et al., 2008). Based on this notion, the SCT provides a basis for intervention strategies by evaluating behavioral changes based on environmental, behavioral, and personal factors (Bandura, 1997). In other words, the SCT offers guidance in designing and implementing intervention programs, including obesity intervention programs (Klohe-Lehman et al., 2006).

To implement an effective program, there are four major components aimed modifying the three factors of the SCT. The first component is informational, which includes increasing people's awareness and knowledge of health risks (Bandura, 1994).

The second component is the development of the social and self-regulative skills in order to translate informed concerns into effective preventive action (Bandura, 1994). The third component is the enhancement of social proficiency and resiliency of self-efficacy through opportunities of guided practice and corrective feedback in modifying and applying the new skills, i.e. healthy nutritional habits (Bandura, 1994). The fourth and final component is creating social supports for a healthier personal change (Bandura, 1994). Collectively, these four components would apply to self-directed change of behaviors.

Application of SCT is useful for studying nutritional and physical activity behaviors among various populations, including the healthy and the unhealthy or chronically ill. Self-efficacy, outcome expectations, and self-regulation (control of oneself through self-monitoring, goal setting, feedback, self-reward, self-instruction, and enlistment of social support) have consistently been related to nutrition and physical activity behavior (Anderson et al., 2007; McAlister et al., 2008; Netz & Raviv, 2004; Patterson et al., 2014; Petosa et al., 2003). These studies have acknowledged the importance of developing interventions that address self-efficacy in nutritional and physical activity behaviors. Effective preventive actions come from people possessing enough knowledge or sound information on how health risks occurs, receiving guidance on how to regulate their behaviors for a healthier lifestyle, and building firm belief in their personal efficacy (Bandura, 1994). In other words, when one has knowledge, skills, and confidence or when one gains motivation and increases self-efficacy while expecting concrete outcomes, people are likely to engage in positive behaviors (Bandura, 1989).

Grembrowski et al. (1993) supported Bandura's (1989) statement that conducting health related behavior with a high self-efficacy allows people to seek preventive care, exercise often, and view their health in a more positive manner. For example, correlations between health knowledge and behavior increased among those with higher self-efficacy (Rimal, 2000). Further, long-term adherence of exercise and diet in one's life has been predicted by self-efficacy (Chapman-Novakofski & Karduck, 2005; McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). Not only self-efficacy, but other SCT components of outcome expectations and self-regulation have predicted nutritional and physical activity behaviors (Anderson-Bill, Winett, & Wojcik, 2011; Anderson, Wojcik, Winett, & Williams, 2006; Petosa et al., 2003). With improved or higher self-efficacy, weight loss or maintenance of a healthy weight is effective (Roach et al., 2003). With an understanding of the determinants of monitoring and maintaining a healthy diet and an active lifestyle, such as nutritional and physical activity behaviors as well as self-efficacy, effective dietary and physical activity interventions can be constructed, particularly among deaf and hard of hearing adults.

Literature Review

Obesity Defined

Obesity in public health is defined using body mass index (BMI). Among adults of ages 20 years or older, the BMI is calculated by dividing the weight of the person in kilograms by the square of one's height in meters or by dividing the weight of the person in pounds by the square of the height in inches and multiplying it by the number 703 (Centers for Disease Control and Prevention [CDC], 2014b). BMI scores that fall below

18.5, between 18.5 and 24.9, between 25.0 and 29.9, and above 30 classify the adult as underweight, normal, overweight, and obese respectively (Centers for Disease Control and Prevention [CDC], 2014b). Most studies show that as one gains more weight, as little as one pound, their health risk increases (Centers for Disease Control and Prevention [CDC], 2012b). Obesity-related conditions or health risks include heart disease, diabetes, stroke, and some cancers including, but not limited to breast cancer, colon cancer, and kidney cancer (Centers for Disease Control and Prevention [CDC], 2012b).

Disability Defined

Disability is defined as "a physical or mental condition that significantly limits a person's motor, sensory, or cognitive abilities" (The American Heritage, 2015, para. 1). There are various categories of disabilities including vision, movement, thinking, remembering, learning, communicating, and hearing (Centers for Disease Control and Prevention [CDC], 2014a). However, most studies broadened the definition of disabilities rather than examine particular classifications of disabilities. For instance, in Anderson et al.'s (2013) study, disability was defined as having a physical, mental, or emotional problem that limits one in any way in any activity. In other words, adults who had a "deficit in activities of daily living (ADL), such as bathing, eating, or toileting, or instrumental activities of daily living (IADL), such as shopping and paying bills" were reported or classified as disabled (Anderson et al., 2013, p. E799). Similarly, Froehlich-Grobe et al.'s (2013) study defined disability as having limitations or difficulties in conducting a particular activity. However, disability was classified into three categories

(mobility limitations, non-mobility limitations, and no limitations) following Rasch et al.'s (2008) definition of disability, which were from the 1996 Medical Expenditure Panel Survey (MEPS). Those who were categorized as mobility limitations experienced difficulty in walking without an assistance device or special equipment, climbing stairs, walking a certain distance, standing for a certain amount of time, or stooping, crouching, or kneeling to pick up something (Froehlich-Grobe et al., 2013; Rasch et al., 2008). In addition, those who used assistive devices other than mobility devices were classified as non-mobility limitations (Froehlich-Grobe et al., 2013; Rasch et al., 2008). No limitations classifications were applied if neither mobility limitations nor non-mobility limitations were classified. Thus, with a broad and inconsistent definition of disabilities, the obesity prevalence among disabilities is not fully understood, particularly with certain categories of disabilities such as deaf or hard of hearing. Deaf and hard of hearing people are classified as those with a disability, but they are ambulatory compared to others with limited physical mobility.

Deaf and Hard of Hearing Defined

The deaf and hard of hearing community is diverse with variations in the following categories: cause of hearing loss, degree of hearing loss, age of onset, educational background, communication methods, and how individuals feel about or identify themselves with their hearing loss (National Association for the Deaf [NAD], n.d.). Medically, hearing loss is classified from audiometer measurements of hearing loss in decibels as shown in Table 1.

Table 1. *Hearing loss classification*.

Hearing Loss Classification	Hearing Loss in Decibels (dB)
Normal	- 10 to 25 dB
Mild	26 to 40 dB
Moderate	41 to 70 dB
Severe	71 to 90 dB
Profound	91+ dB

However, among those who have a hearing loss, common terminologies used to describe their hearing loss are deaf, Deaf, and hard of hearing. Distinctions with the use of capitalization between deaf and Deaf people are based on whether or not one shares a language of ASL and a culture, in which Deaf people are those who share a language and culture (Padden & Humphries, 1988). Hard of hearing people, on the other hand, are those with mid-to-moderate hearing loss or those who do not want to associate themselves as deaf or Deaf ("For hearing people only: Are hard-of-hearing people part of the Deaf community?," 1997). In addition, for reasons of individual choice and environmental or situational factors, communication modalities, and acculturation among deaf, Deaf, and hard of hearing adults vary. Communication modalities that are used include the oral method with the use of lip-reading or speech; cued speech method which facilitates lip-reading with hand gestures and use of speech; manual communication method which includes hand gestures without using speech through ASL, manual English, or fingerspelling; and total communication method which includes using any combination of communication methods (Gravel & O'Gara, 2003).

Acculturation Defined

Acculturation is related to social identity, but it is more comprehensive. Acculturation "involves a process of psychological and behavioral change that occurs as

individuals engage in ongoing contact with a new culture" whereas social identity is the degree of psychological identification with a particular cultural group (D. Maxwell-McCaw & Zea, 2011). In other words, it explains the deaf or hard of hearing person's identity. For example, hard of hearing or deaf people who grow up within an environment that allows them to learn and use sign language, be a part of the deaf community, and are involved in Deaf culture are likely to develop a deaf identity. Deaf or hard of hearing people who grow up and interact with hearing people orally, and do not become a part of the deaf community are likely to develop a hearing identity. Deaf or hard of hearing people who are comfortable in both deaf and hearing communities may develop a bicultural identity. Deaf or hard of hearing people who are not comfortable in both deaf and hearing communities may develop a marginal identity.

Obesity Prevalence

Obesity Prevalence of United States Adults

In the last three decades, from 1980 to 2010, the rate of obesity for adults nearly doubled, and obesity has become a major public health problem (Harvard School of Public Health [HSPH], 2013). Obesity is defined as "the condition of being obese; increased body weight caused by an excessive accumulation of fat" (The American Heritage, 2014, para. 1). The World Health Organization (2014) adds to the definition of obesity by defining it as overweight and obese with "abnormal or excessive fat accumulation that may impair health" (2014, para. 2). Among all Organization Economic Co-operation and Development (OECD) countries in the world, United States is in the lead with 69.0% of adults aged 20 years old or older classified as overweight or

obese (Nejat, Polotsky, & Pal, 2010; Ogden et al., 2014). As of 2012, there was not one state in the United States that had a prevalence of obesity less than 20% (Centers for Disease Control and Prevention [CDC], 2014c). Colorado had the lowest prevalence at 21.3% whereas Mississippi and West Virginia were tied for the highest prevalence at 35.1% (Centers for Disease Control and Prevention [CDC], 2014c). If trends continue, each state will have an obesity prevalence of at least 44% by 2030 (Healthy Americans, 2013; Levi et al., 2013). It is evident that obesity is a health risk for the general population. Therefore, it can be assumed that it is also a factor for people with a disability.

Obesity Prevalence of United States Adults with Disabilities

Obesity is a leading secondary condition reported by people with disabilities with their disability listed as the primary condition (Institute of Medicine, 2007). In adults with sensory, physical, and mental health disability, obesity is more prevalent compared to those without a disability (Anderson et al., 2013; Froehlich-Grobe et al., 2013; Weil et al., 2002). In a secondary data analysis of pooled data from the 1994-1995 National Health Interview Survey (NHIS), the 1994-1995 Disability Supplement (NHIS-D), and Healthy People 2000 Supplement, Weil et al. (2002) examined obesity among adults with disabling conditions. The NHIS data are collected through personal household interviews, and participants are selected from a multistage area probability design (Centers for Disease Control and Prevention [CDC], 2012a). The MEPS data are also collected in a similar manner as the NHIS (U.S. Department of Health & Human Services [DHHS], 2009). Disability in Weil et al.'s (2002) study was classified into six

categories: blind/low vision, deaf/hard of hearing, lower extremity mobility difficulty, upper extremity mobility difficulty, hand dexterity difficulty, and serious mental illness. However, it is not entirely clear on how or what data was used to classify the disability. Despite some ambiguity in the definition of disability, the obesity prevalence among adults with a disability was 24.9% compared to 15.1% among adults without a disability (Weil et al., 2002). These findings of greater obesity prevalence among adults with a disability compared to those without a disability are supported in other studies. For instance, Anderson et al. (2013) conducted a secondary data analysis using data from NHIS and the Medical Expenditure Panel Survey (MEPS) to estimate the obesity prevalence and the average health care expenditures for overweight and obesity among adults with and without a disability. The disability measure was obtained from the NHIS, and disability was defined as "having a limitation in any way in any activity because of physical, mental, or emotional problem" (Anderson et al., 2013, p. 799). The results showed that the obesity prevalence was 37% among adults with a disability compared to 27% of those without a disability (Anderson et al., 2013). Similarly, Froehlich-Grobe et al. (2013) did a secondary data analysis using a different set of data. The authors pooled six waves of data from the National Health and Nutrition Examination Survey (NHANES) to examine the disparities in obesity and related conditions among Americans with disabilities (Froehlich-Grobe et al., 2013). The NHANES data is collected similarly to the NHIS, except it also includes a physician examination (Zipf et al., 2013). Participants are also selected from a multistage area probability design (Zipf et al., 2013). In this study, adults with a disability were identified based on self-reported

data. The disability was classified into one of the three categories (mobility limitations, non-mobility limitations, and no limitations) following Rasch et al.'s (2008) definition of disability, which were from the 1996 Medical Expenditure Panel Survey (MEPS) (Froehlich-Grobe et al., 2013). Mobility limitations were for those who experienced difficulty in walking without an assistance device or special equipment, climbing stairs, walking a certain distance, standing for a certain amount of time, or stooping, crouching or kneeling to pick up something (Froehlich-Grobe et al., 2013; Rasch et al., 2008). Non-mobility limitations were for those who experienced difficulty in lifting, reaching overhead, grasping, moving objects, seeing, hearing, communicating, thinking, and performing ADL or IADL (Froehlich-Grobe et al., 2013; Rasch et al., 2008). In addition, those who used assistive devices other than mobility devices were classified as non-mobility limitations (Froehlich-Grobe et al., 2013; Rasch et al., 2008). No limitations classifications were applied if neither mobility limitations or non-mobility limitations were classified. In this study, the prevalence was slightly higher at 41.6% among those with a disability compared to 29.2% among those without a disability (Froehlich-Grobe et al., 2013).

Despite studies of the prevalence of obesity among adults with disabilities, the definition of disability has not been uniform as described earlier, and the obesity prevalence of subgroups with certain disabilities, specifically those who are deaf or hard of hearing, were not examined. Further, inclusion of deaf and hard of hearing adults in studies with populations who are disabled is questionable for three reasons. Deaf and hard of hearing adults are often excluded from health research and public health

surveillance that are typically performed through telephone surveys (Barnett, Klein, et al., 2011; Barnett, McKee, et al., 2011). Secondly, English is a second language after ASL for those who are deaf since birth. Thus, written English surveys or questionnaires may have been inadequate for those who have low English literacy and prefer ASL (Barnett, Klein, et al., 2011; Barnett, McKee, et al., 2011). Thirdly, due to the nature of probability design, particularly for national surveys like NHIS and NHANES, the chances of selecting a household with a deaf or hard of hearing person is slim. If the selection of a deaf or hard of hearing participant occurs, the chances of an interview with the participant are slimmer if there are communication barriers between the interviewer and the participant. Interviews or communication with deaf or hard of hearing participants require more time and effort than hearing participants, and often require interpreter services for efficient communication (Barnett, Klein, et al., 2011; Barnett, McKee, et al., 2011). Therefore, it is not entirely clear if there is an inclusion of deaf and hard of hearing adults in the obesity prevalence studies. Even if they were, it is not clear how the obesity prevalence differs among the deaf and hard of hearing adults compared to those without a disability. Without an understanding of the obesity prevalence among the deaf and hard of hearing adults, this particular population may be suffering from greater health disparities compared to those without a disability. Therefore, it warrants the need to close the gap in obesity research with a comprehension of the severity of obesity prevalence and the need for obesity intervention within the population of deaf and hard of hearing adults.

Obesity Prevalence of United States Deaf and Hard of Hearing Adults

Of published studies that addressed the gap of the obesity prevalence among deaf or hard of hearing, Weil et al. (2002) classified disability into six different categories: blind/low vision, deaf/hard of hearing, lower extremity mobility difficulty, upper extremity mobility, hand dexterity difficulty, and serious mental illness. As indicated earlier, the secondary data analysis demonstrated that the obesity prevalence among those with and without disabilities were 24.9% and 15.1%, respectively. Rates of obesity were more prevalent among adults with disabilities than those without a disability (Weil et al., 2002). Further, rates of overweight were higher among those who were deaf or hard of hearing whereas rates were slightly lower among other disability groups compared to those without a disability (Weil et al., 2002). However, as described earlier, it is not clear on how disability, particularly deaf or hard of hearing people, were classified. Deaf and hard of hearing was defined as having difficulty hearing normal conversations or using a hearing aid (Weil et al., 2002). While this definition may appear sufficient, the study does not provide descriptive statistics on the participants' hearing loss. Participants who are deaf or hard of hearing can range from those with mild hearing loss (little to some trouble hearing normal conversations) to those with profound hearing loss (inability of hearing normal conversations or using hearing aids). Further, the mean age of the deaf/hard of hearing participants in Weil et al.'s (2002) study was 62.5 years old. Based on this information, it gives reason to speculate that a majority the participants may have been elderly adults with mild hearing loss. If this is the case, then including mostly elderly adults with mild hearing loss and excluding those with other

scales of hearing loss may bias the study. In another published study, a group of authors conducted a community based participatory research with a convenience sampling design to measure the obesity prevalence among adults who are deaf sign language users in Rochester, New York (Barnett, Klein, et al., 2011). The Rochester telephone Behavioral Risk Factors Surveillance System (BRFSS) results of hearing adults were used for comparison. Compared to adults (aged 20 years and older) without a disability, the prevalence of overweight and obesity were greater among deaf adults (Barnett, Klein, et al., 2011). While the authors focused exclusively on deaf adults, and demonstrated that obesity is more prevalent among those who are deaf compared to those who are not, there may be a threat to the internal validity of the study. The survey among deaf and hard of hearing adults was conducted in 2008, whereas the telephone BRFSS data was from 2006. Even if the authors attempted to match each case as closely as possible, comparisons of results from different years might provide different results than comparisons of results from the same year. Further, it is not fully understood whether it is more prevalent among those with certain hearing levels or acculturation. More specifically, it is only known that the participants in the study were users of ASL. Thus, it is not clear if there was an inclusion criterion established based on their fluency of ASL to participate in the study. Further, it is not clear if deaf participants who are users of ASL had varying degrees of hearing loss from mild to profound. Deaf people primarily use ASL, whereas ASL is one of the several communication options used by hard of hearing adults (National Institute on Deafness and Other Communication Disorders [NIDCD], 2014). Therefore, it is possible that the study included hard of hearing adults

who may have mild hearing loss. However, if the participants were mostly deaf adults, it may bias the study. Particularly more so if a majority of the deaf adults share a similar degree of hearing loss.

Upon examining and understanding deaf individuals' reading or literacy skills, research shows that the average (median) reading level of deaf and hard of hearing adults after graduating high school is the fourth grade (Mayberry, 2002). As a result of this, deaf and hard of hearing adults are more inclined to experience health disparities, including obesity, due to health illiteracy or health literacy barriers (Mayberry, 2002; Pollard & Barnett, 2009; Smith, n.d.). However, Chamberlain (2002) examined the ASL and reading skills of random deaf adults who primarily uses ASL and found that those who scored high on the sign language tasks exhibited a reading level of the eighth grade or higher. Further, those who scored low on the sign language tasks exhibited reading levels that were below the fourth grade level (Chamberlain, 2002). In addition, among those who performed poorly on the sign language tasks, but read well (above the fourth grade level), they were capable of speaking English successfully (Chamberlain, 2002). In other words, communication modalities used between deaf individuals and others may have an influence on deaf individuals' functional literacy skills. Smith (n.d.) clarifies from a formative research that the influence may be based on deaf individuals' perceived quality of communication with their parents. Their cultural preferences sometimes differentiate preferences for a specific language, such as spoken English or ASL. Thus, acculturation or the "process of psychological and behavioral change that occurs as individuals engage in ongoing contact with a new culture" may have an impact on one's

quality of life (Gerich & Fellinger, 2012; D. Maxwell-McCaw & Zea, 2011). In a study examining the interrelations between acculturation styles and self-esteem as well as satisfaction with life among deaf and hard of hearing people (aged 14 to 73 years old) in Germany, those with bicultural, deaf, and hearing acculturation styles have a greater self-esteem and satisfaction of life compared to those with marginal acculturation style (Hintermair, 2008). Thus, the research of Hintermair's (2008) gives reason to believe that acculturation may influence one's health beahviors, including obesity or nutrition and physical activities.

Summary and Conclusions

While two published studies, Barnett, Mckee, et al. (2011) and Weil et al. (2002), examined the obesity prevalence among deaf and hard of hearing adults, both studies lacked a concise definition of deaf and hard of hearing. Participants were described as either deaf and ASL users (Barnett, Klein, et al., 2011) or deaf/hard of hearing with "difficulty hearing normal conversations or uses hearing aid" (Weil et al., 2002, p. 1265). Without understanding the inclusion criteria or characteristics of deaf adults, inferring and generalizing the results to the deaf and hard of hearing adult population is limited. In other words, it is uncertain if obesity is more prevalent among those with profound hearing loss, severe hearing loss, mild hearing loss, or any form of hearing loss. Further, it is uncertain if obesity is more prevalent among those with certain acculturation styles. In Barnett, Klein et al.'s (2011) study, the participants were deaf adults who use ASL, but it cannot be assumed that the participants have a deaf identity based on their use of ASL and in Weil et al.'s (2002) study, the details of the participants' level of hearing loss or

identity is unknown. Thus, it is uncertain if obesity is more prevalent among those who have a deaf, hearing, bicultural, or marginal identity. The same can be said with respect to the nutritional and physical activity behaviors. Given that there are no published studies on the nutritional and physical activity behaviors associated with the constructs of SCT among deaf and hard of hearing adults in the United States, very little is known. It is these questions of obesity prevalence and nutritional and physical activity behaviors among deaf and hard of hearing adults that are answered in this study. In chapter 3, the research design, methodology (e.g. population, sampling strategy, recruitment strategy, and instrumentation), validity, and ethical procedures of the study will be discussed.

Chapter 3: Methodology

Introduction

Limited research on obesity prevalence and nutritional and physical activity behaviors among deaf and hard of hearing adults in the United States warrants the need for this study. Available obesity prevalence research on deaf and hard of hearing adults suggests that obesity is greater among those who are deaf and hard of hearing compared to those who are hearing. However, ambiguous operational definitions of deaf and hard of hearing as well as the lack of clarity in participants' hearing levels and deaf acculturation style present difficulties in interpreting and generalizing the results of obesity prevalence among deaf and hard of hearing adults. Despite limited understanding on the obesity prevalence among deaf and hard of hearing adults, there has not been any published research on the behaviors of nutrition or physical activity among deaf and hard of hearing adults. Thus, the purpose of this study was to examine the obesity prevalence and the nutritional and physical activity behaviors among deaf and hard of hearing adults, aged 20 years and older, in the United States with clear operational definitions of hearing loss classifications and acculturated style.

In this methodology chapter, information is provided to assist researchers in understanding the mechanisms of the research and in replicating the study as needed. The chapter discusses the research design and rationale, threats to validity, and ethical procedures. Within the research design and rationale, the study variables; research design; population; sampling, recruitment, and data collection procedures; and instrumentation and operationalization of the constructs are discussed. This section

concludes with a discussion of the ethical procedures with a summary of design and methodology of this quantitative research.

Research Design and Rationale

Given that this study did not entail the use of experiment or treatment, and this research examined the prevalence of obesity, a quantitative, cross-sectional observational, survey design was appropriate for this research. A cross-sectional study design is an observational study where participants are observed based on the exposure of interest, and there are no interference within the study (Field, 2013). While this study obtained data on obesity prevalence, it also obtained data on the nutritional and physical activity behaviors, particularly for the research questions of comparisons between groups. For these types of research questions, cross-sectional designs are useful (Field, 2013). As with any design, there are advantages and disadvantages.

An advantage of a cross-sectional design is that it is cost effective and time saving compared to other research designs (Field, 2013). It provides a methodology for collecting information about the participants at one point in time without the risk of loss to follow up (Field, 2013; Levin, 2006). In other words, a cross-sectional study is a "'snapshot' of the outcome and the characteristics associated with it, at a specific point in time" (Levin, 2006, p. 24). The one-time cross-sectional design offers the most practical method of obtaining obesity prevalence of a population. However, it is of importance to note that cross-sectional designs offer a snapshot of the prevalence, also known as point prevalence. As a result, this design is disadvantageous with its inability to make a causal inference and the propensity of different results if the researcher replicates the study

during another time frame (Levin, 2006). Thus, interpretation and generalization of results from this study will have to be carefully made based on the limitations that the design presents.

Methodology

Population

The target population for this study was deaf and hard of hearing adults and hearing adults, aged 20 years or older. When analyzing and understanding the deaf and hard of hearing population, it is challenging due to measuring instruments that tend to either ignore deaf and hard of hearing individuals or group deaf individuals with those who have a disability, including those who are immobile (Harrington, 2014). If and when deaf and hard of hearing individuals are participants in studies, they are typically grouped and identified as those with a "hearing loss." Hearing loss is a broad and ambiguous definition, and it can include various people from mild hearing loss to profound hearing loss, as well as those who were born deaf to those who had a late onset of hearing loss and can have normal hearing function with a hearing aid (Harrington, 2014). As a result, the count can vary. Therefore, the population of the proposed study was deaf and hard of hearing adults at Gallaudet University, in which the counts are more accurate. Gallaudet University is the only university in the world that primarily serves deaf and hard of hearing students. Gallaudet University not only serves deaf and hard of hearing students, but hearing students. Therefore, the population of the proposed study was also hearing adults at Gallaudet University. The university consists a total of 1,444 degree-seeking students and 890 employees (Gallaudet University, 2014a, 2014b).

Among those, 1,118 (77.4%) students and 461 (51.8%) employees are deaf or hard of hearing (Gallaudet University, 2014a, 2014b). In the next section, the sampling and sampling procedures will be discussed.

Sampling and Sampling Procedures

To estimate the population parameters from the sample statistics, a representative sample with the least bias is necessary (Frankfort-Nachmias & Nachmias, 2008). Probability sampling designs make it possible to generate a representative sample with a single draw from the population (Frankfort-Nachmias & Nachmias, 2008). The population of interest for the study was deaf and hard of hearing adults and hearing adults, aged 20 years or older, at Gallaudet University. Given the age criterion, an exclusion criterion of those who are not 20 years of age or older was established. As will be discussed later in this chapter, deaf and hard of hearing adults completed a Deaf Acculturation Survey (DAS) in addition to the survey administered to hearing adults. Therefore, an exclusion criterion of those who have normal (-10 to 15 dB) or slight (16 to 25 dB) hearing levels in both ears was established to exclude hearing adults from the DAS survey. A list of students and employees' names and e-mail addresses was obtained from the Office of Institutional Research at Gallaudet University. The names were ordered alphabetically and then assigned a four-digit number. Using Microsoft Excel, random four-digit numbers were generated and documented. The researcher randomly selected participants until the number of sample size was met. While the advantages of simple random sampling presents the least amount of bias, it is also important to keep in mind that it can lead to poor representation if the random numbers

generated do not create a representative sample, especially when conducting comparative analysis of small categories of a population (Daniel, 2012).

There are four interrelated components that may influence the conclusions derived from a statistical test. They are the sample size, effect size, alpha level, and power (Trochim, 2006). Of the four components, if three predetermined values are established or given, then the fourth value can be calculated. In other words, when calculating an adequate sample size for a particular statistical test, the three components (effect size, alpha level, and power) need to be established. The effect size refers to the substantive significance or how strong the relationship between two variables is (Sullivan & Feinn, 2012). For the purpose of this study, the chosen effect size will be medium to reflect a medium magnitude of differences found. The alpha level or significance level, labeled as α, is considered a type I error in which one falsely rejects the null hypothesis (Forthofer, Lee, & Hernandez, 2007). Thus, the desire is to establish an alpha level that is low in order to reduce the chance of falsely rejecting a null hypothesis. Most researchers use an alpha level of 0.05, which also means a confidence level of 0.95, which is derived by calculating $1 - \alpha$ (Forthofer et al., 2007). To describe in depth, the confidence level is the probability of accepting the null hypothesis when it should be accepted, and this value should be as large as possible. The beta level, labeled as β, is considered as a type II error in which one accepts the null hypothesis when it should have been rejected (Forthofer et al., 2007). Thus, the desire is also to establish a beta level that is low in order to reduce the chance of accepting a null hypothesis when it should have been rejected. Most researchers use a beta level of 0.20, which also means a power level of

0.80, which is derived by calculating 1 – β (Forthofer et al., 2007). To describe in depth, power is the probability of rejecting the null hypothesis when it should be rejected, and this value should be as large as possible (Forthofer et al., 2007).

In calculating the sample size for this study, an interest of the study was to determine the prevalence of obesity. The sample size calculation for understanding the prevalence of a condition is shown in figure 2, with the following: the population value (N), the expected frequency of the condition under study (p), margin of error or precision (d), and confidence interval level value (z) (Daniel, 1999).

$$= \ ^{2}\frac{(1- \ )\times(\ )}{\times}$$

$$= \frac{\qquad}{1+—}$$

Figure 3. *Sample size formula for prevalence studies (Daniel, 1999)*

With this formula, the population value (N) is 1,469 (1,008 students and 461 employees who are deaf or hard of hearing). The expected frequency of the condition under study came from the obesity prevalence of the United States adult population, which is 34.9% from the Ogden, Carroll, Kit, and Flegal (2014) study. An acceptable margin of error for the study is 5%, and an acceptable confidence interval level is 95%, which gives a z-value of 1.96. Thus, the calculated sample size was:

$$= \ ^{2}\frac{(1- \ )\times(\ )}{\times} = (1.96)^{2}\frac{(0.651)\times(0.349)}{0.05\times 0.05} = 349.123071$$

$$= \frac{349.123071}{1+\frac{349.123071}{1469}} = 282.0831 = 282$$

Figure 4. *Sample size calculation (Daniel, 1999)*

As shown in the sample size calculation, a sample size of at least 282 was necessary. However, obesity prevalence was not the only interest for this research. Understanding whether or not there is an association between levels of hearing loss or deaf acculturation style and BMI while controlling for other variables was another interest for this research. For this type of analysis, a multiple regression was the appropriate statistical test. The same statistical test was appropriate for understanding the association between levels of hearing loss or deaf acculturation style and nutritional and physical activity behaviors while controlling for other variables. Based on the G*Power analysis shown in figure 5, an alpha value of 0.05, a power of 0.80, a medium Cohen's f effect size estimate of 0.25, and four predictor (independent or covariate) variables, a sample size of 53 was adequate.

F tests - Linear multiple regression: Fixed model, R^2 deviation from zero

Analysis:	A priori: Compute required sample size		
Input:	Effect size f^2	=	0.25
	α err prob	=	0.05
	Power (1-β err prob)	=	0.80
	Number of predictors	=	4
Output:	Noncentrality parameter λ	=	13.2500000
	Critical F	=	2.5652405
	Numerator df	=	4
	Denominator df	=	48
	Total sample size	=	53
	Actual power	=	0.8027401

Figure 5. *G*Power Analysis for multiple regression (Faul, Erdfelder, Lang, & Buchner, 2007)*

Since there was also a comparative analysis of the obesity prevalence and nutritional and physical activity behaviors between deaf and hard of hearing adults and hearing adults, the *t* test was an appropriate statistical test for this analysis. Based on the G*Power analysis shown in figure 6, a two-tails test, an alpha value of 0.05, a power of 0.80, and a medium Cohen's effect size of 0.5, sample sizes of at least 64 for each group (deaf and hard of hearing adults and hearing adults) was adequate. After considering all of the sample size calculations and the research questions, sample sizes of at least 64 for each group (deaf and hard of hearing adults and hearing adults) or a total sample size of at least 128 was necessary for this research. However, as with any survey, oversampling was considered to account for attrition or nonresponses. In other words, the researcher continued random sampling until the sample size was adequate.

```
t tests - Means: Difference between two independent means
(two groups)

Analysis:   A priori: Compute required sample size
Input:      Tail(s)                          =   Two
            Effect size d                    =   0.5
            α err prob                       =   0.05
            Power (1-β err prob)             =   0.80
            Allocation ratio N2/N1           =   1
Output:     Noncentrality parameter δ        =   2.8284271
            Critical t                       =   1.9789706
            Df                               =   126
            Sample size group 1              =   64
            Sample size group 2              =   64
            Total sample size                =   128
            Actual power                     =    0.8014596
```

Figure 6. *G*Power Analysis for t tests (Faul et al., 2007)*

Recruitment, Participation, and Data Collection

Participants were randomly selected using a probability sampling design as described earlier in this chapter. Each participant was invited via e-mail to participate in the survey along with a link to the survey via SurveyMonkey. In addition, the invitation e-mail included a copy of the informed consent. In the informed consent, it explained that once the participant clicks on the survey link, they have provided their consent of participating, and they have the option of quitting the survey at any time by closing the web browser. Refer to Appendix A for a copy of the informed consent. When the participant clicked on the survey link, the data was collected electronically via SurveyMonkey. Questions asked of the participants were demographic, deaf acculturation, and nutrition and physical activity behaviors. Demographic questions

included their age, sex, ethnicity, weight, height, and hearing level. Deaf acculturation questions were from the DAS survey developed by Maxwell-McCaw and Zea (2011). Nutrition and physical activity behaviors questions were from the Health Beliefs Survey developed by Anderson-Bill et al. (2011). After the participant completed the survey, participants were thanked for completing the survey, reminded about the confidentiality of the survey, and reminded about contacting the researcher if they are interested in the results of the study. Given the nature of the cross-sectional study design, the participants were not contacted for follow-up.

Instrumentation and Operationalization of Constructs

The dependent, independent, and covariate variables in the study helped the researcher understand the obesity prevalence and nutritional and physical activity behaviors among deaf and hard of hearing adults. The outcome or dependent variables in the study were BMI and the SCT construct of self-efficacy associated with nutritional and physical activity behaviors. The independent variables in the study were hearing levels and deaf acculturation styles with age, ethnicity, and sex as covariates. The BMI and SCT constructs were continuous variables whereas the hearing levels and deaf acculturation styles were categorical variables. The operationalization of variables is found in Appendix B. Each instrument used for this study is explained next.

Demographic. A demographic questionnaire was used to collect and assess basic information about the participants' age, sex, weight, height, level of hearing loss, and ethnicity. The demographics questionnaire is available in Appendix C.

Health Beliefs Survey. The Health Beliefs Survey (HBS) was developed to measure the nutrition- and physical activity-related social support, self-efficacy, outcome expectations, and self-regulations (Anderson et al., 2007). As a reminder, social support, self-efficacy, outcome expectations, and self-regulations are constructs of the social cognitive theoretical framework.

The Health Beliefs Survey was refined and piloted among a sample (N = 158) of two church congregations after it was shown to be reliable and valid in previous research (Anderson et al., 2007; Anderson, Winett, Wojcik, & Williams, 2010; Anderson et al., 2006). Anderson et al. (2010) did an exploratory factor analysis of the health belief survey responses to identify the factor-based scales as well as computed the internal consistency or Cronbach's alphas. Each scale and subscale along with the number of items within each subscale and Cronbach alphas are listed in Table 2.

Table 2. *Social cognitive measures: scale and sub-scale descriptions and Cronbach's alpha estimates*.

Variable	*Sub-scale*	*# Items*	*α*
Nutrition Social Support	Lower fat	8	0.89
	Higher fiber, fruits and vegetables	7	0.88
Nutrition Self-Efficacy	Decreasing fat	12	0.89
	Increasing fiber, fruits and vegetables	12	0.90
	Reducing sugar	6	0.76
Nutrition Outcome Expectations	Positive outcome expectations	10	0.90
	Negative outcome expectations	8	0.82
Nutrition Self-Regulation	Calories and fat	13	0.90
	Plan Track	9	0.91
	Fiber, fruits and vegetables	3	0.85
Physical Activity Support	Family social support	4	0.71
Physical Activity Self-Efficacy	Integrating physical activity in the daily routine	12	0.89
	Overcoming barriers to increasing physical activity	11	0.91
Physical Activity Outcome Expectations	Positive outcome expectations	11	0.93
	Negative outcome expectations	10	0.81
Physical Activity Self-regulation	Self-regulation	8	0.83

A copy of the HBS was obtained by directly contacting Dr. Anderson-Bill of Virginia Polytechnic Institute and State University in an email inquiry about the instrument. Permission to use the instrument was granted by Dr. Anderson-Bill as indicated by her e-mail consent. A copy of permission from Dr. Anderson-Bill is available in Appendix D, and a copy of the questionnaire is available in Appendix E.

Deaf Acculturation Scale. The Deaf Acculturation Scale (DAS) is a scale that was developed by Maxwell-McCaw and Zea (2011). DAS is intended to measure the cultural identity for deaf and hard of hearing populations. The DAS was developed to develop an acculturation measure that is both multidimensional and bilinear, specifically for deaf and hard of hearing people (Maxwell-McCaw & Zea, 2011). In other words, the

DAS was developed to measure the range of how deaf and hard of hearing people acclimate with their acculturative experiences with both deaf and hearing worlds (Maxwell-McCaw & Zea, 2011).

Individual items were developed to match constructs identified by researchers who were competent in deaf culture, deaf identity, and acculturation to the hearing world (Maxwell-McCaw & Zea, 2011). Subscales of cultural identity, cultural involvement, cultural preferences, cultural knowledge, and language competence as well as acculturation to deaf culture (DASd) scale and acculturation to hearing culture (DASh) scale consist a total of 58 items rated on a Likert type scale from 1 (strongly disagree) to 5 (strongly agree). Identification of these 58 items occurred after conducting a pilot study of a previous DAS with 70 items, and factor analyses of the second DAS with 78 items. Initial results of the 70 items DAS showed acceptable internal consistency across all subscales, except for DASh (which has been corrected) as well as acceptable concurrent validity (Maxwell-McCaw & Zea, 2011). In addition, Cronbach's alphas of the DAS were .32 for one subscale, 0.57 for another subscale, and above 0.77 for all of the other subscales. Whereas, the Cronbach's alphas for the DASd and DASh were 0.95 and 0.86 respectively (Maxwell-McCaw & Zea, 2011). Revisions to the DAS were made to improve internal consistency by removing and adding items to the cultural identification subscales, which created the 78 items DAS (Maxwell-McCaw & Zea, 2011). Exploratory and confirmatory factor analyses were then conducted to the 78 items DAS. In this study, the sample of 3,070 deaf and hard of hearing individuals nationwide was split into two groups. Two exploratory factor analyses required one-third of the

sample (N = 1,041), and one confirmatory factor analysis required two-thirds of the sample (N = 2,029). In the first exploratory factor analysis, the results indicated that the five subscales accounted for 60.4% and 51.2% of the variance on the DASd and DASh scales respectively (Maxwell-McCaw & Zea, 2011). Removal of the items occurred if items had a factor loading of 0.50 or ambiguously on more than one subscales (Maxwell-McCaw & Zea, 2011). As a result of this activity, a total of 20 items were removed. In the second exploratory factor analysis, the factor structure of the remaining 58 items was examined. Results indicated that the five subscales accounted for 64.9% and 59.1% of the variance on the DASd and DASh scales respectively (Maxwell-McCaw & Zea, 2011). In the confirmatory factor analysis, the adequacy of fit of the different factor models was tested, and the five-factor (five-subscales) correlated model yielded the best fit for both acculturation scales (Maxwell-McCaw & Zea, 2011). Reliabilities of the subscales and scales were acceptable with Cronbach's alpha coefficients for the subscales ranging from 0.84 to 0.92 and 0.71 to 0.85 for the DASd and DASh scales respectively. Further, the Cronbach's alpha coefficients were 0.95 and 0.91 for the overall DASd and DASh scales respectively. Concurrent validity of the DAS was established by demonstrating that groups can be differentiated by the DAS based on parental hearing status, school backgrounds, and use of self-labels (Maxwell-McCaw & Zea, 2011).

A copy of the DAS was obtained by directly contacting Dr. Maxwell-McCaw of Gallaudet University in an email inquiry about the instrument. Permission to use the instrument was granted by Dr. Maxwell-McCaw as indicated by her e-mail consent. A

copy of permission from Dr. Maxwell-McCaw is available in Appendix F, and a copy of the questionnaire is available in Appendix G.

Data Analysis Plan

Data collected from the participants were obtained from SurveyMonkey and entered into Microsoft Excel. From Microsoft Excel, the data was exported into the statistical software, IBM SPSS Statistics 21. Specifics on how the data was protected and kept confidential are described later in this chapter. If there were incomplete data that cannot be used for the analysis (i.e. missing responses for one's hearing level or missing responses for an item that contributes to the calculations of an SCT scale), the participant's responses were omitted from the study. If there were participants who did not fit the inclusion criterion, their responses were omitted from the study. Descriptive statistics including the mean, standard deviation, frequencies, and percentages were calculated for the demographic data. The following hypotheses guided the analysis:

RQ1: In individuals aged 20 and older, are there differences in obesity when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss)?

Hypothesis 1

$H1_0$: In individuals aged 20 and older, there is no difference in obesity as measured by Body Mass Index (BMI) when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and

hearing adults (dB of 25 and less or normal to slight hearing loss) as measured by levels of hearing loss.

$H1_A$: In individuals aged 20 and older, there are differences in obesity as measured by BMI when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss) as measured by levels of hearing loss.

RQ2: In individuals aged 20 and older, is level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 2

$H2_0$: In individuals aged 20 and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is not significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H2_A$: In individuals aged 20 and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ3: In individuals aged 20 years old and older who are deaf and hard of hearing, is acculturation style (hearing acculturated, marginal, deaf acculturated, or bicultural) significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 3

$H3_0$: In individuals aged 20 years old or older who are deaf or hard of hearing (as measured by levels of hearing loss), acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural), as measured by Deaf Acculturation Scale (DAS), is not significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H3_A$: In individuals aged 20 years old or older who are deaf or hard of hearing, (as measured by levels of hearing loss) acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural), as measured by DAS, is significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis and age at time of survey.

RQ4: In individuals aged 20 years old and older, are there differences in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss)?

Hypothesis 4

$H4_0$: In Individuals aged 20 years and older, there is no difference in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by the Health Beliefs Survey (HBS) when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss).

$H4_A$: In individuals aged 20 years and older, there is a difference in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by the HBS when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss).

RQ5: In individuals aged 20 and older, is level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 5

$H5_0$: In individuals aged 20 years and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is not significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors as measured by the HBS in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H5_A$: In individuals aged 20 years and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors as measured by HBS in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ6: In individuals aged 20 years old and older, is acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 6

$H6_0$: In individuals aged 20 years old and older, acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) as measured by DAS is not significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by HBS after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H6_A$: In individuals aged 20 years old and older, acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) as measured by DAS is significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by HBS after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

In examining each hypothesis, the following table describes the analysis plan for each hypothesis.

Table 3. *Analysis Plan for Each Hypothesis.*

Hypothesis	Concept	Data Source	Level of Measurement**	Analysis Procedure
1	Differences in BMI between deaf and hard of hearing adults and hearing adults	Demographics questionnaire	DV: BMI (continuous) Independent: hearing status (categorical) – Quantitative	Two independent sample *t* test
2	Regression analysis of the level of hearing loss factor contributing to BMI after controlling for confounders*	Demographics questionnaire	DV: BMI (continuous) IV: sex (categorical), ethnicity/race (categorical), age of diagnosis (continuous), age at time of survey (continuous), and average hearing loss level (ordinal) – Quantitative	Multiple linear regression
3	Regression analysis of the deaf acculturation factor contributing to obesity after controlling for confounders*	Demographics questionnaire and DAS questionnaire	DV: BMI (continuous) IV: sex (categorical), ethnicity/race (categorical), age of diagnosis (continuous), age at time of survey (continuous), and deaf acculturation (categorical) – Quantitative	Multiple linear regression
4	Differences in SCT constructs between deaf and hard of hearing adults and hearing adults	Demographics questionnaire and HBS questionnaire	DV: nutritional and physical activity self-efficacy (continuous) IV: hearing status (categorical) – Quantitative	Two independent sample *t* test
5	Regression analysis of the level of hearing loss factor contributing to SCT constructs after controlling for confounders*	Demographics questionnaire and HBS questionnaire	DV: self-efficacy (continuous) IV: sex (categorical), ethnicity/race (categorical), age of diagnosis (continuous), age at time of survey (continuous), and average hearing loss level (ordinal) – Quantitative	Multiple linear regression

Hypothesis	Concept	Data Source	Level of Measurement**	Analysis Procedure
6	Regression analysis of the deaf acculturation factor contributing to SCT constructs after controlling for confounders*	Demographics questionnaire and HBS questionnaire	DV: self-efficacy (continuous) IV: sex (categorical), ethnicity/race (categorical), age of diagnosis (continuous), age at time of survey (continuous), and deaf acculturation (categorical) – Quantitative	Multiple linear regression

* Confounders of the study are sex, ethnicity/race, age of diagnosis, and age at time of survey
** DV = dependent variable and IV = independent variable

Threats to Validity

As with any research design, threats to validity need to be considered and reduced in order to ensure that the study is valid, reliable, and credible. Threats to internal validity are associated with the researchers' ability to draw correct inferences from the data about the population. A possible threat to internal validity for cross-sectional studies is selection (Creswell, 2009). Selection effects occur when participants are not randomly selected, or participants are randomly selected and there is an unequal distribution of certain characteristics, e.g. age, sex, and ethnicity (Creswell, 2009). While the threat of selection is an issue for all types of studies, reducing the threat of selection requires random selection and adequate sample size (Creswell, 2009). Even with a random selection and adequate sample size, the threat may still exist. Descriptive statistics of the sample ascertained whether or not the threat of selection was present in the study (Field, 2013).

Threats to external validity are associated with the researchers' ability to make inferences about the study's results and generalize the results to the population (Carlson & Morrison, 2009). Researchers need to understand the limitations of cross-sectional designs to make correct inferences and generalizations about the results. With the cross-sectional design of a one-time data collection or one-time measurement, the exposure and the outcome are measured simultaneously, which eliminates the researcher's ability to establish a temporal relationship (Carlson & Morrison, 2009). Thus, the study refrained from claiming a temporal or directional relationship, even if a correlation or relationship existed between two variables. Further, cross-sectional studies only examine the prevalence of the disease, as opposed to the incidence of the disease (Carlson & Morrison, 2009). In other words, prevalence is associated with people who are living with the disease or condition at one point in time as opposed to incidence, which is associated with the follow-up of people with the disease or condition over time to ascertain new cases of disease (incidence). As a result, cross-sectional studies are likely to generate bias towards survivorship (Carlson & Morrison, 2009). In addition, cross-sectional studies are conducted at one point in time, which means the results of the study is based on the sample during the time and place of the data collection. Thus, the selection of the sample, the setting of the data collection, and the time frame in which the study was conducted can have an effect on the researcher's ability to generalize. To reduce this threat to external validity, a well selected, large, and representative random sample is necessary (Field, 2013).

Threats to the methodology with respect to the measurement instrument in terms of reliability and validity was that the responses to the questionnaires were self-reported. As a result of self-reported data, results may suffer from recall bias. Depending on the context of the question, recall bias can overreport or underreport the results (Bynum, 2009). In addition, the survey was conducted in English as opposed to ASL, which may not be the native language for some of the participants. Therefore, interpreting and generalizing the results was made with caution.

Ethical Procedures

With the use of questionnaires among human subjects, an Institutional Research Board (IRB) approval from Walden University and Gallaudet University was necessary in addition to an informed consent for the participants. Copies of IRB approvals from Gallaudet University and Walden University are in Appendix H and Appendix I, respectively. Participants surveyed in this study are those in the researcher's work environment. Given that the study took place in the researcher's work environment, it is likely that participants knew the researcher and felt obligated to participate, especially those who manage the researcher or report to the researcher. Therefore, participants were carefully and clearly communicated about the study and their rights. Participants were informed of the researcher's employment at Gallaudet University and the use of random sampling to reduce any form of bias in the study. Despite minimal risk to the participants in the study, each participant were informed about what the study is for, how the data will be used for the study, the confidentiality of their reported and recorded data, any benefits or disadvantages of the study, their right to ask for clarification, their right to quit at any

time during the study, and their right to obtain a copy of the results of the study. The informed consent, as described earlier, was provided via e-mail. Given that completing the survey is voluntary and it will take up about 45 minutes to an hour of their time, the participants were not compensated for their participation or time.

Data collected from this study was obtained from SurveyMonkey, and it was and still is confidential. The researcher was and still is the only person who has access to the data, which is protected by a password. Upon downloading the data from SurveyMonkey to Excel for data analysis in SPSS, all personal identifying information was stripped from the dataset. The dataset, without personal identifying information, was saved on the researcher's hard drive and external drive with a protected password. Anyone opening the file will need to know the password, and the researcher was and still is the only person with the password to open the file. After five years, the data will be deleted completely from the researcher's hard drive and external drive.

Summary

Chapter 3 began with an explanation of how a cross-sectional study design allows an examination of the association between obesity and factors of hearing level and deaf acculturation style. Not only that, but also the association between nutritional and physical activity behaviors and factors of hearing level and deaf acculturation style. In other words, the research design and rationale for the research design was described. Next, the methodology of the study was discussed, which included details on the population; sampling and sampling procedures; recruitment, participation, and data collection; instrumentation and operationalization of constructs; and data analysis plan.

Details provided in the methodology section allow researchers to replicate the study. After addressing the methodology, threats to validity and ethical considerations for this study were discussed.

In Chapter 4, a detailed overview of the actual data collection and results will be discussed. Descriptive statistics and results along with assumptions made from each statistical analysis for this study are to be presented.

Chapter 4: Results

Introduction

In the United States, obesity increased over the last three decades, which suggests an increased risk for associated morbidities. Studies on subpopulations such as those with a disability found that these subpopulation are experiencing disproportionately higher obesity rates compared to the general population (Anderson et al., 2013; Froehlich-Grobe et al., 2013; Weil et al., 2002). Disparities in obesity are evident that differences in obesity prevalence are approximately 10% higher among those with a disability compared to those without a disability (Anderson et al., 2013; Froehlich-Grobe et al., 2013). Therefore, people with disabilities, including deaf and hard of hearing adults, are at a greater risk of morbidity.

When understanding the obesity prevalence among deaf and hard of hearing adults, there are gaps in knowledge about the association between obesity and level of hearing loss or deaf acculturation style. At the time of writing, only two published studies addressed the obesity prevalence among deaf and hard of hearing adults, those who are American Sign Language users or have difficulties hearing. Both studies indicated greater obesity prevalence among deaf and hard of hearing adults compared to adults who did not have a disability (Barnett, Klein, et al., 2011; Weil et al., 2002). However, characteristics including the level of hearing loss and deaf acculturation style among deaf and hard of hearing adults who participated in the studies lack, which limits interpretation and generalization of the results. Also, there is limited research in knowledge about the association between obesity and its determinants such as nutritional

and physical activity behaviors among deaf and hard of hearing adults. This baseline study of the association between obesity and level of hearing loss, deaf acculturation style, and dietary and physical activity behaviors may provide knowledge and understanding in developing and implementing appropriate and adequate obesity interventions for deaf and hard of hearing adults.

The researcher addressed the following research questions and hypotheses in this study:

RQ1: In individuals aged 20 and older, are there differences in obesity when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss)?

Hypothesis 1

$H1_0$: In individuals aged 20 and older, there is no difference in obesity as measured by Body Mass Index (BMI) when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss) as measured by levels of hearing loss.

$H1_A$: In individuals aged 20 and older, there are differences in obesity as measured by BMI when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss) as measured by levels of hearing loss.

RQ2: In individuals aged 20 and older, is level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 2

$H2_0$: In individuals aged 20 and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is not significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H2_A$: In individuals aged 20 and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ3: In individuals aged 20 years old and older who are deaf and hard of hearing, is acculturation style (hearing acculturated, marginal, deaf acculturated, or bicultural) significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 3

$H3_0$: In individuals aged 20 years old or older who are deaf or hard of hearing (as measured by levels of hearing loss), acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural), as measured by Deaf Acculturation Scale (DAS), is not significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H3_A$: In individuals aged 20 years old or older who are deaf or hard of hearing, (as measured by levels of hearing loss) acculturated style (hearing acculturated,

marginal, deaf acculturated, or bicultural), as measured by DAS, is significantly associated with BMI after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ4: In individuals aged 20 years old and older, are there differences in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss)?

Hypothesis 4

$H4_0$: In Individuals aged 20 years and older, there is no difference in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by the Health Beliefs Survey (HBS) when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss).

$H4_A$: In individuals aged 20 years and older, there is a difference in the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by the HBS when comparing deaf and hard of hearing adults (dB of 26 and greater or mild hearing loss to profound hearing loss) and hearing adults (dB of 25 and less or normal to slight hearing loss).

RQ5: In individuals aged 20 and older, is level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 5

$H5_0$: In individuals aged 20 years and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is not significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors as measured by the HBS in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H5_A$: In individuals aged 20 years and older, level of hearing loss (dB 26 to 40, dB 41 to 55, dB 56 – 70, dB 71 – 90, and dB 91+) is significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors as measured by HBS in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

RQ6: In individuals aged 20 years old and older, is acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey?

Hypothesis 6

$H6_0$: In individuals aged 20 years old and older, acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) as measured by DAS is not significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by HBS after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

$H6_A$: In individuals aged 20 years old and older, acculturated style (hearing acculturated, marginal, deaf acculturated, or bicultural) as measured by DAS is significantly associated with the social cognitive theoretical constructs of nutritional and physical activity behaviors in maintaining a healthy weight as measured by HBS after adjusting for sex, race/ethnicity, age at diagnosis, and age at time of survey.

In this chapter, information about the data collection including the actual recruitment, response rate, discrepancies in the data collection from planned, and how representative the sample is of the population is discussed. Results for each analysis of the research question including descriptive statistics, statistical assumptions, and statistical analysis findings are presented. This section concludes with a discussion of the answers to the research questions.

Data Collection

Recruitment and Time Frame

Exploratory research is designed for research problems when there are few to no earlier studies to refer to (Stebbins, 2001). This dissertation is an exploratory research

study in which data was collected and analyzed for the purpose of understanding the association of obesity and level of hearing loss, deaf acculturation style, and nutritional and physical activity determinants among deaf and hard of hearing adults at Gallaudet University. Also, differences of obesity (as assessed with BMI) between hearing adults and deaf and hard of hearing adults at Gallaudet University were compared to understand the disparity of obesity. A cross-sectional design was used in this study. To limit the threats to the internal validity of the study, random samplings of participants were conducted over a period of two and a half months. Participants were invited to participate in the study from December 3, 2015 through February 15, 2016.

Discrepancies in Data Collection from the Planned

Unexpectedly, some of the e-mail addresses were not valid or had already opted out of any surveys from SurveyMonkey. Also, a majority of the participants chose not to participate in the survey. As mentioned earlier, the data collection for this study was conducted from December 3, 2015 through February 15, 2016. A random sampling of 500 participants was selected and invited to participate in the study. Four weekly reminder e-mails were sent to participants who had not completed the survey. In each of the reminder e-mail, participants were informed that they could contact the researcher if they wished to opt out of the survey, which also included opting out of the reminder e-mails. Responses from the participants were low with a response rate of 8% (n = 42). As a result of the low response rate, two weeks after the first group of participants were invited, another random sampling of 500 participants were selected and invited to participate in the study. Reminder e-mails were sent to the second group in the same

manner as the first group. Responses from the second group generated an 8% response rate (n = 40). Further, a majority of the respondents were those who are deaf or hard of hearing. Hearing participants were not participating, which led to another random sampling of 500 participants. The third group was invited to participate in the survey two weeks after the second group of participants were invited. Responses from this group improved with a response rate of 12% (n = 61).

During the time of data collection, the researcher learned that hearing participants assumed that the survey was only for deaf and hard of hearing adults despite an explanation in the informed consent form that hearing participants are welcome to participate. Due to time constraints, the data collection ended before the sample size of hearing adults could be met. Further, participants e-mailed the researcher to ask how they were selected and wondered if they were selected because they were overweight even though the consent form explained that they were randomly selected. Therefore, due to the discrepancies in the data collection from the planned data collection, the results may not be truly representative of the obesity prevalence at Gallaudet University and should be interpreted with caution.

Descriptive Statistics of Participants

In this study, a total of 1,463 participants, 87% of the participants (n = 1,273) opened the survey. However, a smaller number of 241 participants completed the survey. Out of the total of 241 participants who responded to the survey, 35 were excluded because they did not meet the inclusion criteria of being a United States citizen or of age 20 years or older. An additional two participants were excluded since they responded

that they were deaf but noted that they had normal hearing in both ears. Therefore, a total of 203 respondents were included in the analyses. The distribution of demographic characteristics is shown in Table 4. Approximately two-thirds (66%) of the respondents were female, and 34% were male. The age range reported most frequently and least frequently were 20 to 29 at 37.9% and 60 to 69 at 6.4% respectively. Respondents were predominately white with 70.4% of the participants identifying themselves as White.

Table 4. *Demographic Characteristics (N = 203)*

Variable	Category	*n*	%
Sex			
	Male	69	34.0%
	Female	134	66.0%
Ethnicity/Race			
	Asian	8	3.9%
	Black/African American	17	8.4%
	Hispanic of any race	17	8.4%
	Two or more	17	8.4%
	Unknown	1	0.5%
	White	143	70.4%
Hearing Status			
	Deaf	115	56.7%
	Hard of hearing	34	16.7%
	Hearing	54	26.6%
Age			
	20 – 29	77	37.9%
	30 – 39	39	19.2%
	40 – 49	42	20.7%
	50 – 59	32	15.8%
	60+	13	6.4%

Table 5 presents BMI categories of the 203 participants. Participants' BMI was calculated using their reported height and weight. Approximately 36.5% (n = 74) women were overweight (BMI 25.0 – 29.9) or obese (BMI > 30), whereas approximately 25.1% (n = 51) men were overweight or obese. Further, approximately 45.8% (n = 93) deaf and

hard of hearing adults were overweight or obese, whereas approximately 15.8% (n = 32) hearing adults were overweight or obese. Table 6 presents average level of hearing loss among deaf and hard of hearing participants. At least half (53.7%) of the deaf participants reported an average hearing level of profound, and the average hearing level most frequently reported among hard of hearing adults was moderate at 8.2%.

At Gallaudet University, approximately 67% of students and employees are deaf or hard of hearing, and approximately 53% of students and employees are white. The sample aligned with the population with a majority of the sample representing deaf or hard of hearing and white. However, the sample may be over-representative since approximately 73% of the sample is deaf and hard of hearing, and approximately 70% of the sample's race/ethnicity is white. Also, a majority (54.7%) of the deaf and hard of hearing participants had a profound average level of hearing loss. Due to the over-representation of deaf or hard of hearing adults, deaf and hard of hearing adults with a profound level of hearing loss, and adults whose race/ethnicity is White; the results may not be truly representative of the United States population. Therefore, interpretation and generalization of the results should be done with caution.

Table 5. *Body Mass Index of Participants (N = 203)*

Demographic Characteristics			BMI Categories									
			Underweight < 18.5		Normal 18.5 – 24.9		Overweight 25.9 – 29.9		Obese > 30		Total	
Ethnicity	Sex	Hearing Status	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Asian												
	Male											
		Deaf					1	(0.5)	2	(1.0)	3	(1.5)
		Hard of hearing										
		Hearing										
	Female											
		Deaf			1	(0.5)	1	(0.5)			2	(0.01)
		Hard of hearing					1	(0.5)			1	(0.00)
		Hearing			1	(0.5)	1	(0.5)			2	(0.01)
Black/African American												
	Male											
		Deaf			1	(0.5)			1	(0.5)	2	(0.01)
		Hard of hearing			2	(1.0)	1	(0.5)			3	(0.01)
		Hearing										
	Female											
		Deaf					3	(1.5)			3	(0.01)
		Hard of hearing					1	(0.5)	1	(0.5)	2	(0.01)
		Hearing					1	(0.5)	6	(3.0)	7	(0.03)

Demographic Characteristics			BMI Categories							
			Underweight < 18.5		Normal 18.5 – 24.9		Overweight 25.9 – 29.9		Obese > 30		Total	
Ethnicity	Sex	Hearing Status	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Hispanic of any race												
	Male											
		Deaf			1	(0.5)	1	(0.5)	2	(1.0)	4	(0.02)
		Hard of hearing			1	(0.5)					1	
		Hearing							1	(0.5)	1	(0.00)
	Female											
		Deaf			4	(2.0)	1	(0.5)	1	(0.5)	6	(3.0)
		Hard of hearing			2	(1.0)	1	(0.5)	2	(1.0)	5	(2.5)
		Hearing										
Two or more												
	Male											
		Deaf			2	(1.0)	3	(1.5)	3	(1.5)	8	(3.9)
		Hard of hearing										
		Hearing							1		1	(0.5)
	Female											
		Deaf	1	(0.5)	1	(0.5)	2	(1.0)	1	(0.5)	5	(2.5)
		Hard of hearing										
		Hearing			1	(0.5)			2	(1.0)	3	(1.5)

Demographic Characteristics			BMI Categories									
			Underweight < 18.5		Normal 18.5 – 24.9		Overweight 25.9 – 29.9		Obese > 30		Total	
Ethnicity	Sex	Hearing Status	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*
Unknown												
	Male											
		Deaf										
		Hard of hearing										
		Hearing										
	Female											
		Deaf					1	(0.5)			1	(0.5)
		Hard of hearing										
		Hearing										
White												
	Male											
		Deaf			5	(2.5)	12	(5.9)	10	(4.9)	27	(13.3)
		Hard of hearing			3	(1.5)	6	(3.0)	2	(1.0)	11	(5.4)
		Hearing			3	(1.5)	5	(2.5)			8	(3.9)
	Female											
		Deaf			27	(13.3)	13	(6.4)	14	(6.9)	54	(26.6)
		Hard of hearing	1	(0.5)	2	(1.0)	2	(1.0)	4	(2.0)	9	(4.4)
		Hearing			19	(9.4)	8	(3.9)	7	(3.4)	34	(16.7)
Total			2	(1.0)	76	(37.4)	65	(32.0)	60	(29.6)	203	(100)

Table 6. *Level of Hearing Loss Among Deaf and Hard of Hearing Adults (N = 146)*

Variable	Category	*n*	%
2.5 – Mild/Moderate			
	Deaf	3	2.0%
	Hard of hearing	2	1.4%
3 – Moderate			
	Deaf	7	4.8%
	Hard of hearing	12	8.2%
3.5 – Moderate/Severe			
	Deaf	3	2.0%
	Hard of hearing	3	2.0%
4 – Severe			
	Deaf	9	6.1%
	Hard of hearing	10	6.8%
4.5 – Severe/Profound			
	Deaf	14	9.5%
	Hard of hearing	3	2.0%
5 - Profound			
	Deaf	79	53.7%
	Hard of hearing	1	0.7%

Analyses and Results

Research Question (RQ1) Analysis

An independent samples *t* test was conducted to examine the hypothesis of BMI differences between deaf and hard of hearing adults and hearing adults. On average, hearing adults' BMI ($M = 28.21$, $SD = 8.037$) was higher than deaf and hard of hearing adults' BMI ($M = 27.87$, $SD = 5.811$), as shown in Figure 7. However, this difference, -0.285, BMI 95% CI [-2.676, 2.007] was not significant, $t(78) = -0.285$, $p = 0.777$ with an extremely small-sized effect, $d = 0.059$. The effect size index for the independent samples *t* test is Cohen's d, and the formula is shown in Figure 8 (Field, 2013). In summary, there were no differences in obesity (as assessed with BMI) between deaf and hard of hearing adults and hearing adults.

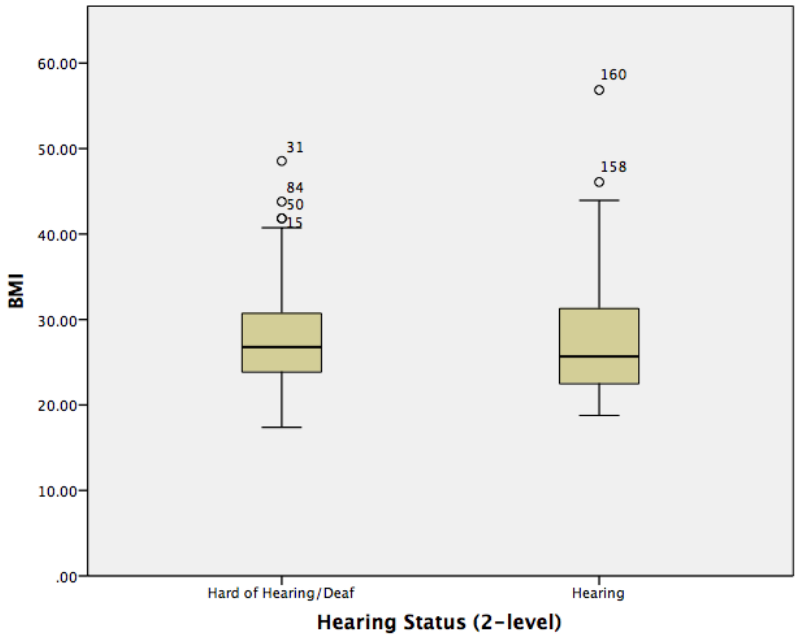

Figure 7. *Box Plots of Deaf and Hard of Hearing Adults' BMI and Hearing Adults' BMI (lb/in^2)*

$$\hat{d} = \frac{\overline{X_1} - \overline{X_2}}{s_2} = \frac{28.21 - 27.87}{5.811} = 0.059$$

Figure 8. *Cohen's Effect Size for RQ1*

Research Question (RQ2) Analysis

A multivariate linear regression analysis was conducted to examine the hypothesis of an association between BMI and average level of hearing loss while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis. Respondents [N = 140] who had completed responses for all variables involved in this analysis were included. The predictors of this analysis were: sex, race/ethnicity, age at time of survey, age at diagnosis, and average level of hearing loss. In this analysis, 60.7% [N = 85] and 39.3% [N = 55] of the participants were females and males, respectively. A majority of the

participants were White at 70.0% [N = 98] followed by Hispanic of any race at 10.0% [N = 14], Two or more race at 9.3% [N = 13], Black/African American at 5.7% [N = 8], Asian at 4.3% [N = 6], and Unknown at 0.7% [N = 1]. Given that the non-White groups' sample size were small, this group was combined with participants identifying themselves as White at 70.0% [N = 98] and non-White at 30.0% [N = 42]. The age at time of survey ranged from 20 to 68 with [M = 37.19, SD = 13.592]. The age at diagnosis ranged from 0 to 15 with [M = 1.24, SD = 2.79]. The average level of hearing loss ranged from 2.5 to 5.0 with [M = 4.43, SD = 0.767]. The dependent variable of this analysis was BMI. The BMI ranged from 17.37 to 48.55 with [M = 28.01, SD = 5.893].

Statistical Assumptions. The predictors for this multivariate linear regression analysis were tested for the assumption of linearity. As shown in Figure 9, there was a slight linear relationship between the BMI and the continuous predictor variables of age and age at diagnosis. The assumption of sampling independence was satisfied since participants were randomly selected and the responses were distinct such that each participant was only able to respond to the survey once. In Figure 10, the dependent variable of BMI appeared to be normally distributed.

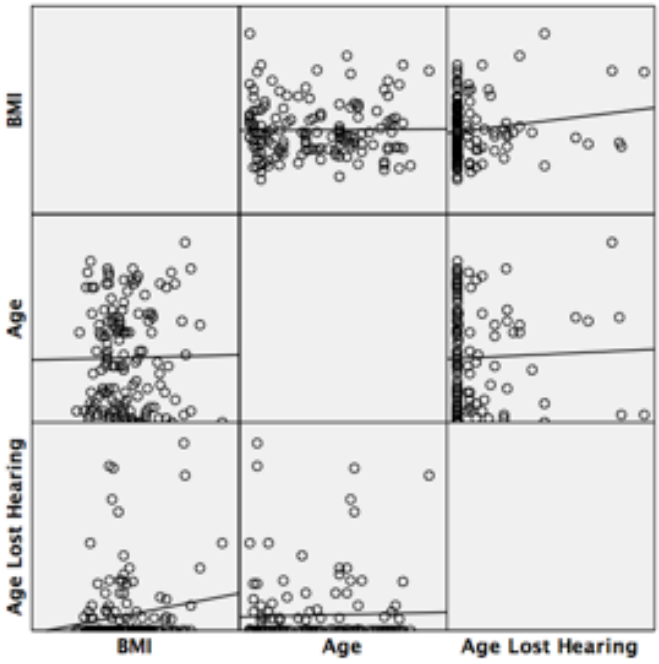

Figure 9. *Scatterplots of BMI (lb/in^2) and Continuous Predictor Variables (age and age at diagnosis hearing) for RQ2*

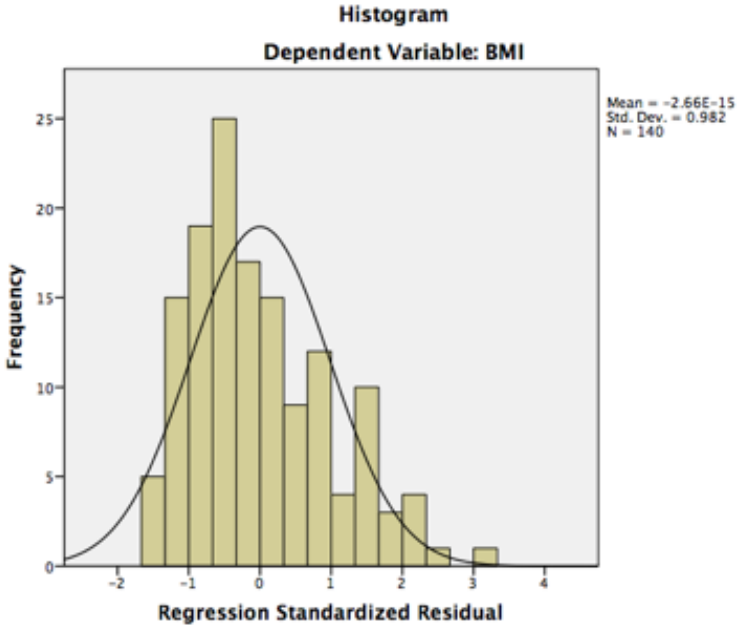

Figure 10. *Distribution of the Dependent Variable: BMI (lb/in^2) for RQ2*

Statistical Analysis. In the model summary for this analysis, the R was slightly positive (R = 0.247), which exhibited a slight positive correlation between sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss, and BMI. With the value of R close to zero, the correlation between all of the predictor variables and BMI was not strong. The coefficient of determination was [$R^2 = 0.061$], which means 6% of the variability in BMI was explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss at the time of collection. Therefore, 94% of the variability may be explained by other variables that were not included in this study.

In the coefficients table, all of the predictor variables except for sex and age at diagnosis were found to be significant. Controlling for sex, race/ethnicity, age at diagnosis, and average level of hearing loss, the BMI decreases by 0.001 for every increase in age (year). Controlling for age, race/ethnicity, age at diagnosis, and average level of hearing loss, BMI decreases by 2.089 for females. Controlling for age, sex, age at diagnosis, and average level of hearing loss, BMI increases by 1.377 for those whose race/ethnicity is White. Controlling for age, sex, race/ethnicity, and average level of hearing loss, BMI increases by 0.362 for every increase in age at diagnosis (year). Controlling for age, sex, race/ethnicity, and age at diagnosis, BMI increases 0.053 for every point increase in the average level of hearing loss. All of the predictor effects, except for sex and age at diagnosis were not statistically significant and had confidence intervals that included 0: age [$\beta = -0.001$, 95% CI (-0.076, 0.074), $p = 0.979$], race/ethnicity [$\beta = 1.377$, 95% CI (-0.793, 3.539), $p = 0.212$], and average level of hearing loss [$\beta = 0.043$, 95% CI (-1.284, 1.390), $p = 0.938$]. The predictor effects, sex

and age at diagnosis, were statistically significant and had confidence intervals that included 0: sex [β = -2.089, 95% CI (-4.090, -0.080), p = 0.042] and age at diagnosis [β = 0.362, 95% CI (0.005, 0.719), p = 0.047].

Research Question (RQ3) Analysis

A multivariate linear regression analysis was conducted to examine the hypothesis of an association between BMI and deaf acculturation style while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis. Respondents [N = 130] who had completed responses for all variables involved in this analysis were included. The predictors of this analysis were: sex, race/ethnicity, age at time of survey, age at diagnosis, and deaf acculturation style. In this analysis, 60.8% [N = 79] and 39.2% [N = 51] of the participants were females and males, respectively. A majority of the participants were White at 70.8% [N = 92] followed by Two or more races at 10.0% [N = 13], Hispanic of any race at 9.2% [N = 12], Black/African American at 5.4% [N = 7], Asian at 3.8% [N = 5], and Unknown at 0.8% [N = 1]. Given that the non-White groups' sample size were small, race/ethnicity groups were combined with participants identifying themselves as White at 70.8% [N = 92] and non-White at 29.2% [N = 38]. The age at time of survey ranged from 20 to 68 with [M = 37.57, SD = 13.704]. The age at diagnosis ranged from 0 to 15 with [M = 1.20, SD = 2.83]. A majority of the participants were deaf acculturated at 50.8% [N = 66]. With the remaining participants, 40.8% [N = 53] of the participants were bicultural, 7.7% [N = 10] of the participants were hearing acculturated, and 0.8% [N = 1] of the participants were marginal. The dependent

variable of this analysis was BMI. The BMI ranged from 17.37 to 48.55 with [*M* = 27.96, *SD* = 6.023].

Statistical Assumptions. The predictors for this multivariate linear regression analysis were tested for the assumption of linearity. As shown in Figure 11, there was a slight linear relationship between the BMI and the continuous predictor variables of age and age at diagnosis. The assumption of sampling independence was satisfied since participants were randomly selected and the responses were distinct such that each participant was only able to respond to the survey once. In Figure 12, the dependent variable of BMI appeared to be normally distributed.

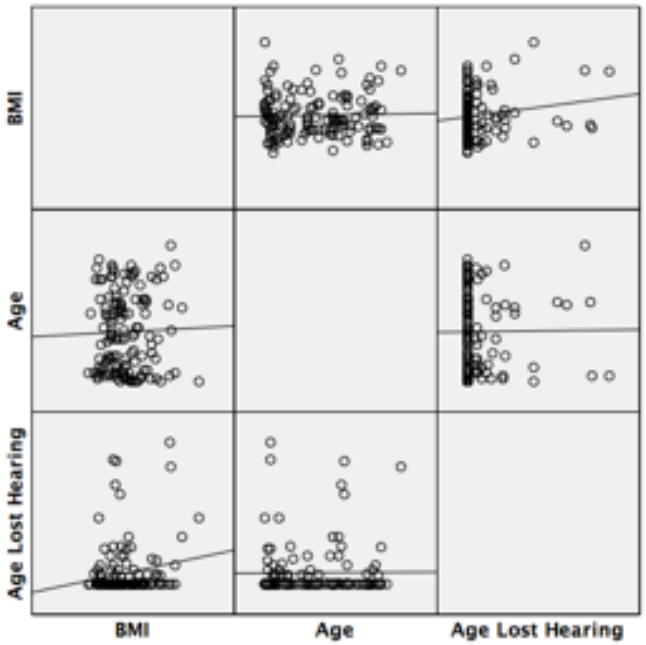

Figure 11. *Scatterplots of BMI (lb/in^2) and Continuous Predictor Variables (age and age at diagnosis hearing) for RQ3*

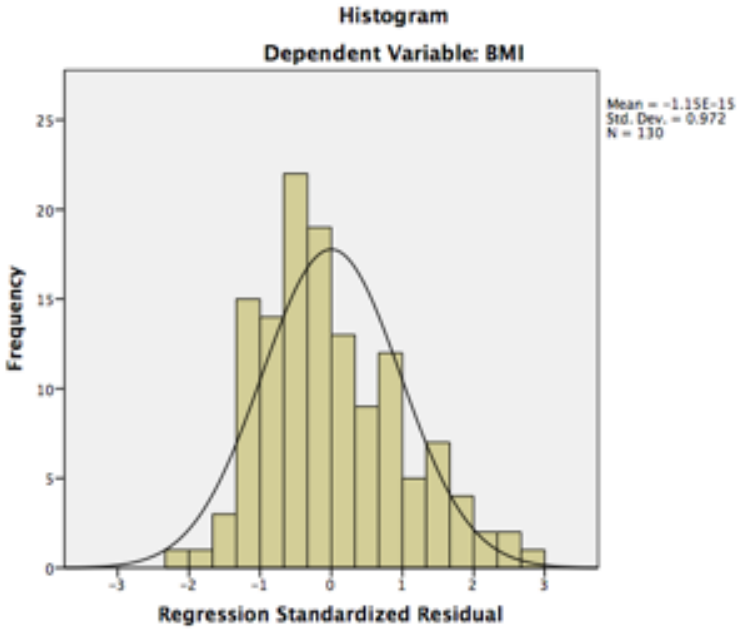

Figure 12. *Distribution of the Dependent Variable: BMI (lb/in^2) for RQ3*

Statistical Analysis. In the model summary for this analysis, the R was slightly positive (R = 0.292), which exhibits a slight positive correlation between sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style, and BMI. With the value of R close to zero, the correlation between all of the predictor variables and BMI was not strong. The coefficient of determination was [$R^2 = 0.085$], which means 8.5% of the variability in BMI is explained by sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style at the time of collection. Therefore, 91.5% of the variability may be explained by other variables that were not included in this study.

In the coefficients table, none of the predictor variables were found to be significant. Controlling for sex, race/ethnicity, age at diagnosis, and deaf acculturation style, the BMI decreases by 0.008 for every increase in age (year). Controlling for age,

race/ethnicity, age at diagnosis, and deaf acculturation style, BMI decreases by 1.892 for females. Controlling for age, sex, age at diagnosis, and deaf acculturation style, BMI increases by 1.301 for those whose race/ethnicity is White. Controlling for age, sex, race/ethnicity, and deaf acculturation style, BMI increases by 0.322 for every increase in age at diagnosis (year). Controlling for age, sex, race/ethnicity, age at diagnosis, and bicultural and hearing acculturation style, BMI increases by 3.738 for those who are deaf acculturated. Controlling for age, sex, race/ethnicity, age at diagnosis, and deaf and hearing acculturation style, BMI increases by 3.901 for those who are bicultural acculturated. Controlling for age, sex, race/ethnicity, age at diagnosis, and deaf and bicultural acculturation style, BMI increases by 7.154 for those who are hearing acculturated. All of the predictor effects were not statistically significant and had confidence intervals that included 0: age [$\beta = 0.008$, 95% CI (-0.070, 0.085), $p = 0.845$], sex [$\beta = -1.892$, 95% CI (-4.048, 0.263), $p = 0.085$], race/ethnicity [$\beta = 1.301$, 95% CI (-1.031, 3.632), $p = 0.272$], age at diagnosis [$\beta = 0.322$, 95% CI (-0.067, 0.711), $p = 0.104$], deaf acculturation style [$\beta = 3.738$, 95% CI (-8.262, 15.738), $p = 0.539$], bicultural acculturation style [$\beta = 3.901$, 95% CI (-8.110, 15.912), $p = 0.522$], and hearing acculturation style [$\beta = 7.154$, 95% CI (-5.296, 19.603), $p = 0.258$].

Research Question (RQ4) Analysis

Nutritional Self-Efficacy. An independent samples *t* test was conducted to examine the hypothesis of nutritional self-efficacy differences between deaf and hard of hearing adults and hearing adults. On average, hearing adults' nutritional self-efficacy ($M = 59.37$, $SD = 24.739$) was higher than deaf and hard of hearing adults' nutritional

self-efficacy (*M* = 54.98, *SD* = 19.934), as shown in Figure 13. However, this difference, -0.962, nutritional self-efficacy 95% CI [-2.676, 2.007] was not significant, *t*(105) = -0.962, *p* = 0.338 with a small-sized effect, d = 0.220. The effect size index for the independent samples *t* test is Cohen's d, and the formula is shown in Figure 14 (Field, 2013). In summary, there were no differences in nutritional self-efficacy between deaf and hard of hearing adults and hearing adults.

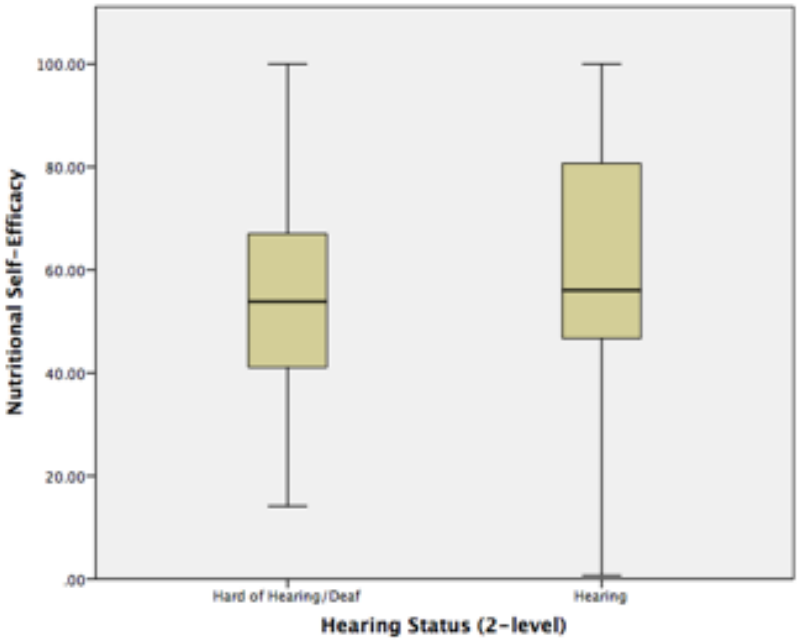

Figure 13. *Box Plots of Deaf and Hard of Hearing Adults' and Hearing Adults' Nutritional Activity Self-Efficacy Scores*

$$\hat{d} = \frac{\overline{X_1} - \overline{X_2}}{s_2} = \frac{59.37 - 54.98}{19.934} = 0.220$$

Figure 14. *Cohen's Effect Size for RQ4 Nutritional Self Efficacy*

Physical Activity Self-Efficacy. An independent samples *t* test was conducted to examine the hypothesis of physical self-efficacy differences between deaf and hard of

hearing adults and hearing adults. On average, hearing adults' physical activity self-efficacy (M = 51.01, SD = 25.196) was lower than deaf and hard of hearing adults' physical activity self-efficacy (M = 55.12, SD = 20.840), as shown in Figure 15. However, this difference, 0.766, physical activity self-efficacy 95% CI [-6.566, 14.788] was not significant, $t(81) = 0.766$, $p = 0.446$ with a small-sized effect, d = 0.163. The effect size index for the independent samples t test is Cohen's d, and the formula is shown in Figure 16 (Field, 2013). In summary, there were no differences in physical self-efficacy between deaf and hard of hearing adults and hearing adults.

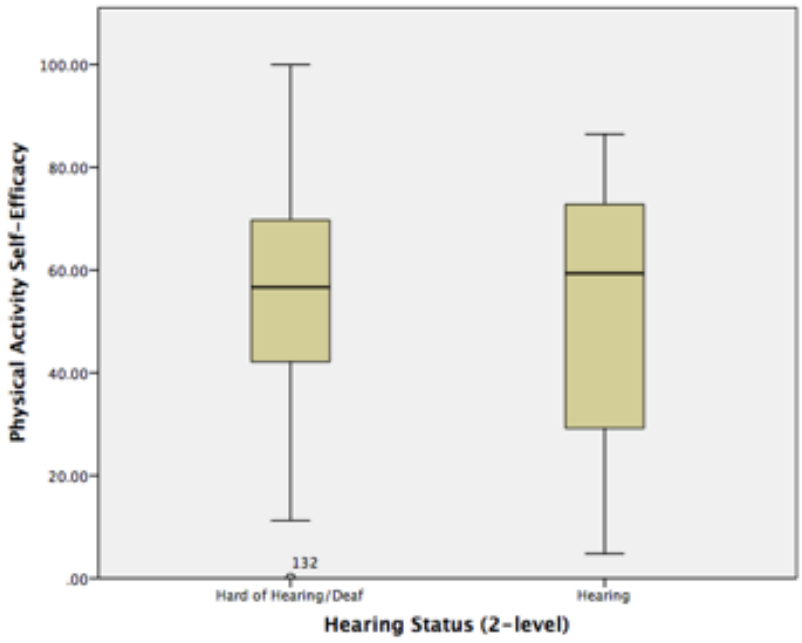

Figure 15. *Box Plots of Deaf and Hard of Hearing Adults' and Hearing Adults' Physical Activity Self-Efficacy Scores*

$$\hat{d} = \frac{\overline{X_1} - \overline{X_2}}{s_2} = \frac{55.12 - 51.01}{25.196} = 0.163$$

Figure 16. *Cohen's Effect Size for RQ4 Physical Activity Self Efficacy*

Research Question (RQ5) Analysis

Nutritional Self-Efficacy. A multivariate linear regression analysis was conducted to examine the hypothesis of an association between nutritional self-efficacy and average level of hearing loss while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis. Respondents [N = 73] who had completed responses for all variables involved in this analysis were included. The predictors of this analysis were: sex, race/ethnicity, age at time of survey, age at diagnosis, and average level of hearing loss. In this analysis, 65.8% [N = 48] and 34.2% [N = 25] of the participants were females and males, respectively. A majority of the participants were White at 68.5% [N = 50] followed by Two or more races at 9.6% [N = 7], Hispanic of any race at 8.2% [N = 6], Black/African American at 6.8% [N = 5], Asian at 5.5% [N = 4], and Unknown at 1.4% [N = 1]. Given that the non-White groups' sample size were small, this group was combined with participants identifying themselves as White at 68.5% [N = 50] and non-White at 31.5% [N = 23]. The age at time of survey ranged from 20 to 68 with [M = 39.04, SD = 13.360]. The age at diagnosis ranged from 0 to 13.17 with [M = 1.03, SD = 2.60]. The average level of hearing loss ranged from 2.5 to 5.0 with [M = 4.40, SD = 0.821]. The dependent variable of this analysis is nutritional self-efficacy. The nutritional self-efficacy score ranged from 14.15 to 98.48 with [M = 53.60, SD = 19.029].

Statistical Assumptions. The predictors for this multivariate linear regression analysis were tested for the assumption of linearity. As shown in Figure 17, there was a slight linear relationship between the nutritional self-efficacy and the continuous

predictor variables of age and age at diagnosis. The assumption of sampling independence was satisfied since participants were randomly selected and the responses were distinct such that each participant was only able to respond to the survey once. In Figure 18, the dependent variable of nutritional self-efficacy appeared to be normally distributed.

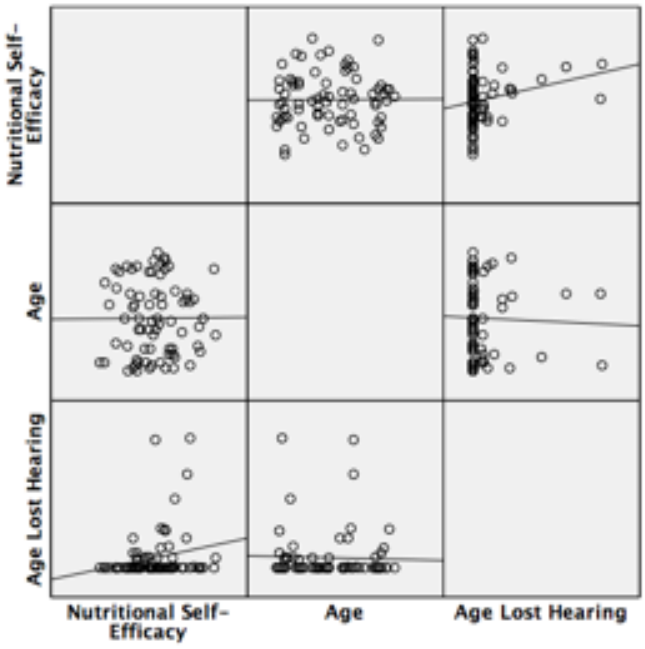

Figure 17. *Scatterplots of Nutritional Self-Efficacy and Continuous Predictor Variables (age and age at diagnosis hearing) for RQ5*

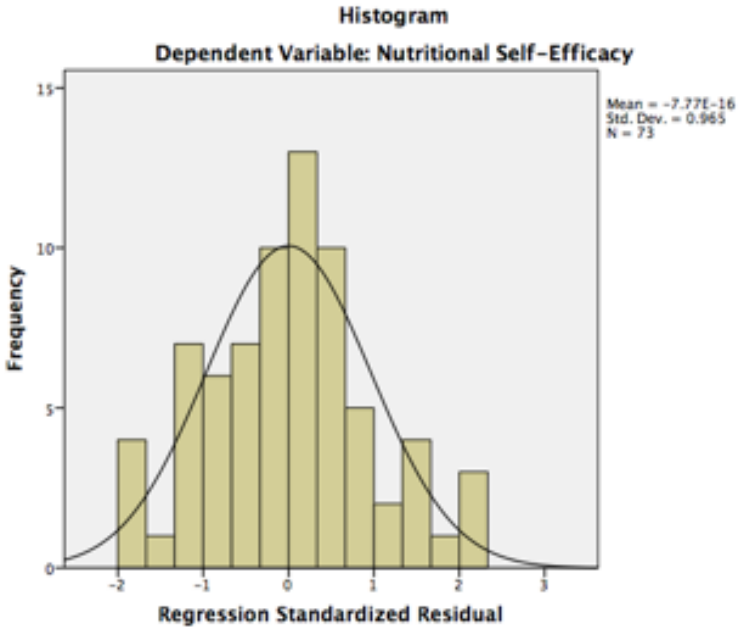

Figure 18. *Distribution of the Dependent Variable: Nutritional Self-Efficacy for RQ5*

Statistical Analysis. In the model summary for this analysis, the R was slightly positive (R = 0.292), which exhibits a slight positive correlation between sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss, and nutritional self-efficacy. With the value of R close to zero, the correlation between all of the predictor variables and nutritional self-efficacy was not strong. The coefficient of determination was [$R^2 = 0.085$], which means 8.5% of the variability in nutritional self-efficacy is explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss at the time of collection. Therefore, 91.5% of the variability may be explained by other variables that were not included in this study.

In the coefficients table, none of the predictor variables were found to be significant. Controlling for sex, race/ethnicity, age at diagnosis, and average level of

hearing loss, the nutritional self-efficacy increases by 0.062 for every increase in age (year). Controlling for age, race/ethnicity, age at diagnosis, and average level of hearing loss, nutritional self-efficacy decreases by 6.001 for females. Controlling for age, sex, age at diagnosis, and average level of hearing loss, nutritional self-efficacy decreases by 1.300 for those whose race/ethnicity is White. Controlling for age, sex, race/ethnicity, and average level of hearing loss, nutritional self-efficacy increases by 1.626 for every increase in age at diagnosis (year). Controlling for age, sex, race/ethnicity, and age at diagnosis, nutritional self-efficacy decreases 1.691 for every point increase in the average level of hearing loss. All of the predictor effects were not statistically significant and had confidence intervals that included 0: age [$\beta = 0.062$, 95% CI (-0.290, 0.415), $p = 0.726$], sex [$\beta = -6.001$, 95% CI (-15.528, 3.525), $p = 0.213$], race/ethnicity [$\beta = -1.300$, 95% CI (-11.125, 8.525), $p = 0.793$], age at diagnosis [$\beta = 1.626$, 95% CI (-0.151, 3.402), $p = 0.072$], and average level of hearing loss [$\beta = -1.691$, 95% CI (-7.725, 4.342), $p = 0.578$].

Physical Self-Efficacy. A multivariate linear regression analysis was conducted to examine the hypothesis of an association between physical self-efficacy and average level of hearing loss while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis. Respondents [N = 57] who had completed responses for all variables involved in this analysis were included. The predictors of this analysis were: sex, race/ethnicity, age at time of survey, age at diagnosis, and average level of hearing loss. In this analysis, 64.9% [N = 37] and 35.1% [N = 20] of the participants were females and males, respectively. A majority of the participants were White at 66.7% [N = 38] followed by Black/African American at 10.5% [N = 6], Two or more races at 8.8% [N =

5], Hispanic of any race at 5.3% [N = 3], Asian at 7.0% [N = 4], and Unknown at 1.8% [N = 1]. Given that the non-White groups' sample size were small, this group was combined with participants identifying themselves as White at 66.7% [N = 38] and non-White at 33.3% [N =19]. The age at time of survey ranged from 20 to 68 with [*M* = 37.86, *SD* = 13.465]. The age at diagnosis ranged from 0 to 13.17 with [*M* = 1.48, *SD* = 3.243]. The average level of hearing loss ranged from 2.5 to 5.0 with [*M* = 4.34, *SD* = 0.835]. The dependent variable of this analysis was physical self-efficacy. The physical self-efficacy score ranged from 0.00 to 100.00 with [*M* = 54.36, *SD* = 20.694].

Statistical Assumptions. The predictors for this multivariate linear regression analysis were tested for the assumption of linearity. As shown in Figure 19, there was a slight linear relationship between the physical activity self-efficacy and the continuous predictor variables of age and age at diagnosis. The assumption of sampling independence was satisfied since participants were randomly selected and the responses were distinct such that each participant was only able to respond to the survey once. In Figure 20, the dependent variable of physical activity self-efficacy appeared to be normally distributed.

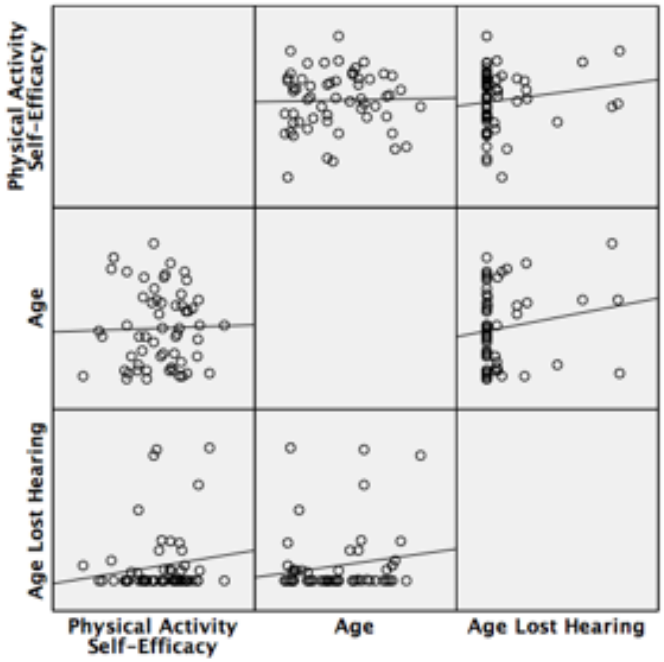

Figure 19. *Scatterplots of Physical Activity Self-Efficacy and Continuous Predictor Variables (age and age at diagnosis hearing) for RQ5*

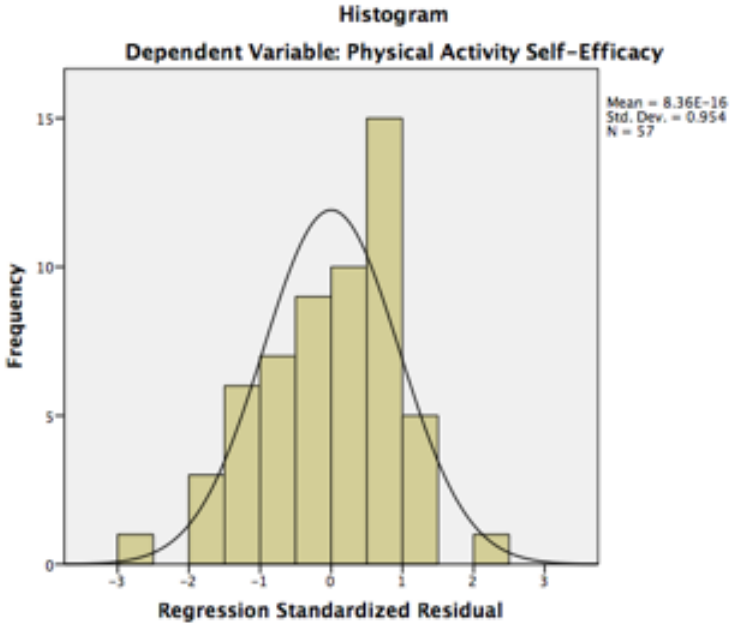

Figure 20. *Distribution of the Dependent Variable: Physical Activity Self-Efficacy for RQ5*

Statistical Analysis. In the model summary for this analysis, the R was slightly positive (R = 0.172), which exhibits a slight positive correlation between sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss, and physical activity self-efficacy. With the value of R close to zero, the correlation between all of the predictor variables and physical activity self-efficacy was not strong. The coefficient of determination was [$R^2 = 0.029$], which means 2.9% of the variability in physical activity self-efficacy was explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss at the time of collection. Therefore, 97.1% of the variability may be explained by other variables that were not included in this study.

In the coefficients table, none of the predictor variables were found to be significant. Controlling for sex, race/ethnicity, age at diagnosis, and average level of hearing loss, the physical activity self-efficacy decreases by 0.028 for every increase in age (year). Controlling for age, race/ethnicity, age at diagnosis, and average level of hearing loss, physical activity self-efficacy decreases by 1.072 for females. Controlling for age, sex, age at diagnosis, and average level of hearing loss, physical activity self-efficacy increases by 3.455 for those whose race/ethnicity is White. Controlling for age, sex, race/ethnicity, and average level of hearing loss, physical activity self-efficacy increases by 1.126 for every increase in age at diagnosis (year). Controlling for age, sex, race/ethnicity, and age at diagnosis, physical activity self-efficacy increases 0.241 for every point increase in the average level of hearing loss. All of the predictor effects were not statistically significant and had confidence intervals that included 0: age [$\beta = -0.028$,

95% CI (-0.494, 0.438), p = 0.905], sex [β = -1.072, 95% CI (-13.248, 11.105), p = 0.860], race/ethnicity [β = 3.455, 95% CI (-9.277, 16.188), p = 0.588], age at diagnosis [β = 1.126, 95% CI (-0.765, 3.016), p = 0.237], and average level of hearing loss [β = 0.241, 95% CI (-7.380, 7.862), p = 0.950].

Research Question (RQ6) Analysis

Nutritional Self-Efficacy. A multivariate linear regression analysis was conducted to examine the hypothesis of an association between nutritional self-efficacy and deaf acculturation style while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis. Respondents [N = 74] who had completed responses for all variables involved in this analysis were included. The predictors of this analysis were: sex, race/ethnicity, age at time of survey, age at diagnosis, and deaf acculturation style. In this analysis, 64.9% [N = 48] and 35.1% [N = 26] of the participants were females and males, respectively. A majority of the participants were White at 68.9% [N = 51] followed by Two or more races at 9.5% [N = 7], Hispanic of any race at 8.1% [N = 6], Black/African American at 6.8% [N = 5], Asian at 5.4% [N = 4], and Unknown at 1.4% [N = 1]. Given that the non-White groups' sample size were small, race/ethnicity groups were combined with participants identifying themselves as White at 68.9% [N = 51] and non-White at 31.1% [N = 23]. The age at time of survey ranged from 20 to 63 with [M = 39.14, SD = 13.293]. The age at diagnosis ranged from 0 to 13.17 with [M = 1.02, SD = 2.59]. A majority of the participants were deaf acculturated at 54.1% [N = 40]. With the remaining participants, 41.9% [N = 31] of the participants were bicultural, 4.1% [N = 3] of the participants were hearing acculturated, and 0.0% [N = 0] of the participants were

marginal. The dependent variable of this analysis was nutritional self-efficacy. The nutritional self-efficacy ranged from 14.15 to 98.48 with [M = 53.99, SD = 19.20].

Statistical Assumptions. The predictors for this multivariate linear regression analysis were tested for the assumption of linearity. As shown in Figure 21, there was a slight linear relationship between the nutritional self-efficacy and the continuous predictor variables of age and age at diagnosis. The assumption of sampling independence was satisfied since participants were randomly selected and the responses were distinct such that each participant was only able to respond to the survey once. In Figure 22, the dependent variable of nutritional self-efficacy appeared to be normally distributed.

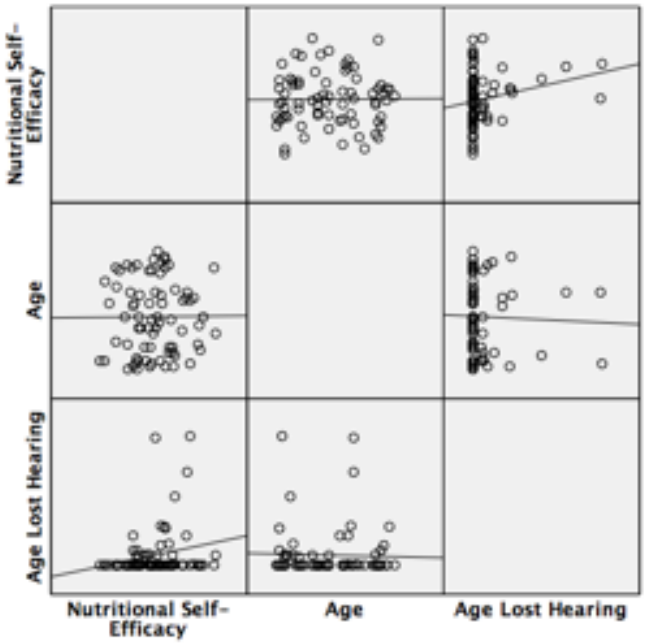

Figure 21. *Scatterplots of Nutritional Self-Efficacy and Continuous Predictor Variables (age and age at diagnosis hearing) for RQ6*

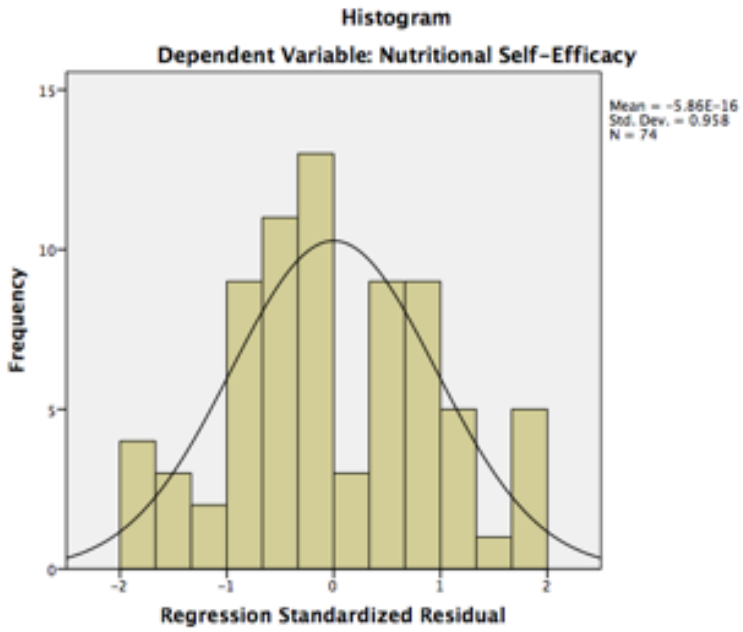

Figure 22. *Distribution of the Dependent Variable: Nutritional Self-Efficacy for RQ6*

Statistical Analysis. In the model summary for this analysis, the R was slightly positive (R = 0.368), which exhibits a slight positive correlation between sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style, and nutritional self-efficacy. With the value of R close to zero, the correlation between all of the predictor variables and nutritional self-efficacy was not strong. The coefficient of determination is [$R^2 = 0.135$], which means 13.5% of the variability in nutritional self-efficacy was explained by sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style at the time of collection. Therefore, 86.5% of the variability may be explained by other variables that were not included in this study.

In the coefficients table, none of the predictor variables were found to be significant. Controlling for sex, race/ethnicity, age at diagnosis, and deaf acculturation style, the nutritional self-efficacy increases by 0.051 for every increase in age (year). Controlling for age, race/ethnicity, age at diagnosis, and deaf acculturation style, nutritional self-efficacy decreases by 7.209 for females. Controlling for age, sex, age at diagnosis, and deaf acculturation style, nutritional self-efficacy decreases by 1.712 for those whose race/ethnicity is White. Controlling for age, sex, race/ethnicity, and deaf acculturation style, nutritional self-efficacy increases by 1.184 for every increase in age at diagnosis (year). Controlling for age, sex, race/ethnicity, age at diagnosis, and deaf and hearing acculturation style, nutritional self-efficacy increases by 9.279 for those who are bicultural acculturated. Controlling for age, sex, race/ethnicity, age at diagnosis, and deaf and bicultural acculturation style, nutritional self-efficacy increases by 5.102 for those who are hearing acculturated. All of the predictor effects were not statistically significant and had confidence intervals that included 0: age [$\beta = 0.051$, 95% CI (-0.282, 0.383), $p = 0.762$], sex [$\beta = -7.209$, 95% CI (-16.354, 1.935), $p = 0.120$], race/ethnicity [$\beta = -1.712$, 95% CI (-11.441, 8.017), $p = 0.727$], age at diagnosis [$\beta = 1.184$, 95% CI (-0.613, 2.982), $p = 0.193$], bicultural acculturation style [$\beta = 9.279$, 95% CI (-0.063, 18.622), $p = 0.052$], and hearing acculturation style [$\beta = 5.102$, 95% CI (-17.466, 27.670), $p = 0.653$].

Physical Self-Efficacy. A multivariate linear regression analysis was conducted to examine the hypothesis of an association between physical activity self-efficacy and deaf acculturation style while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis. Respondents [N = 58] who had completed responses for all

variables involved in this analysis were included. The predictors of this analysis were: sex, race/ethnicity, age at time of survey, age at diagnosis, and deaf acculturation style. In this analysis, 63.8% [N = 37] and 36.2% [N = 21] of the participants were females and males, respectively. A majority of the participants were White at 67.2% [N = 39] followed by Black/African American at 10.3% [N = 6], Two or more races at 8.6% [N = 5], Hispanic of any race at 5.2% [N = 3], Asian at 6.9% [N = 4], and Unknown at 1.7% [N = 1]. Given that the non-White groups' sample size were small, race/ethnicity groups were combined with participants identifying themselves as White at 67.2% [N = 39] and non-White at 32.8% [N = 19]. The age at time of survey ranged from 20 to 68 with [*M* = 38.00, *SD* = 13.389]. The age at diagnosis ranged from 0 to 13.17 with [*M* = 1.46, *SD* = 3.22]. Half of the participants were deaf acculturated at 50.0% [N = 29]. With the remaining participants, 43.1% [N = 25] of the participants were bicultural, 6.9% [N = 4] of the participants were hearing acculturated, and 0.0% [N = 0] of the participants were marginal. The dependent variable of this analysis was physical activity self-efficacy. The physical activity self-efficacy ranged from 0.00 to 100.00 with [*M* = 54.56, *SD* = 20.565].

Statistical Assumptions. The predictors for this multivariate linear regression analysis were tested for the assumption of linearity. As shown in Figure 23, there is a slight linear relationship between the physical activity self-efficacy and the continuous predictor variables of age and age at diagnosis. The assumption of sampling independence was satisfied since participants were randomly selected and the responses were distinct such that each participant was only able to respond to the survey once. In

Figure 24, the dependent variable of physical activity self-efficacy appeared to be normally distributed.

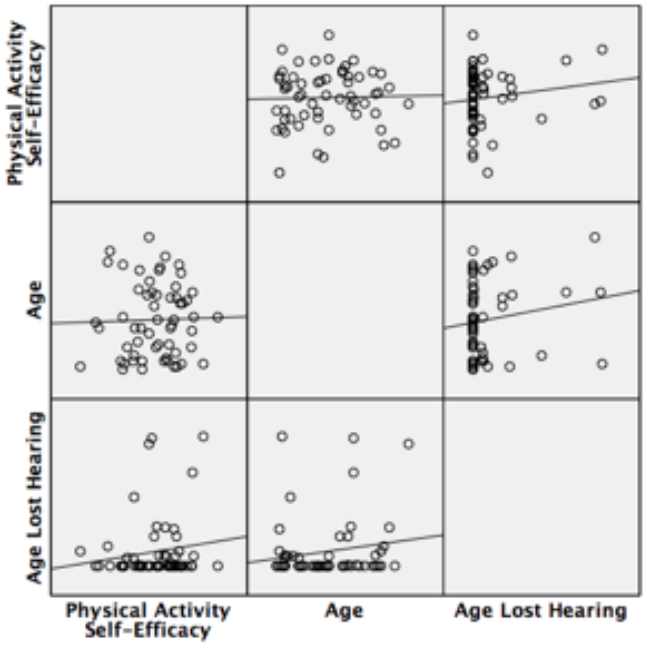

Figure 23. *Scatterplots of Physical Self-Efficacy and Continuous Predictor Variables (age and age at diagnosis hearing) for RQ6*

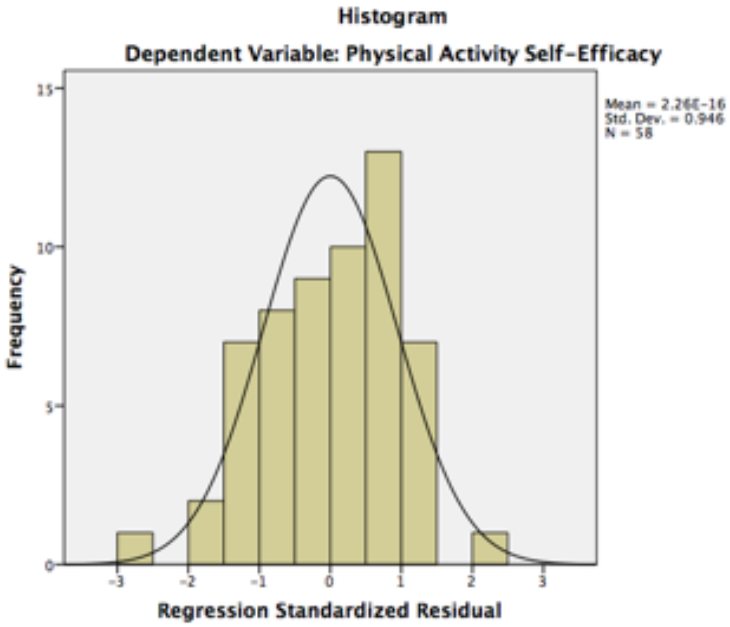

Figure 24. *Distribution of the Dependent Variable: Physical Activity Self-Efficacy for RQ6*

Statistical Analysis. In the model summary for this analysis, the R was slightly positive (R = 0.176), which exhibits a slight positive correlation between sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style, and physical activity self-efficacy. With the value of R close to zero, the correlation between all of the predictor variables and physical activity self-efficacy was not strong. The coefficient of determination was [$R^2 = 0.031$], which means 3.1% of the variability in nutritional self-efficacy was explained by sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style at the time of collection. Therefore, 96.9% of the variability may be explained by other variables that were not included in this study.

In the coefficients table, none of the predictor variables were found to be significant. Controlling for sex, race/ethnicity, age at diagnosis, and deaf acculturation

style, the physical activity self-efficacy decreases by 0.007 for every increase in age (year). Controlling for age, race/ethnicity, age at diagnosis, and deaf acculturation style, physical activity self-efficacy decreases by 1.574 for females. Controlling for age, sex, age at diagnosis, and deaf acculturation style, physical activity self-efficacy increases by 3.483 for those whose race/ethnicity is White. Controlling for age, sex, race/ethnicity, and deaf acculturation style, physical activity self-efficacy increases by 1.064 for every increase in age at diagnosis (year). Controlling for age, sex, race/ethnicity, age at diagnosis, and deaf and hearing acculturation style, physical activity self-efficacy increases by 1.166 for those who are bicultural acculturated. Controlling for age, sex, race/ethnicity, age at diagnosis, and deaf and bicultural acculturation style, physical activity self-efficacy decreases by 1.845 for those who are hearing acculturated. All of the predictor effects were not statistically significant and had confidence intervals that included 0: age [$\beta = -0.007$, 95% CI (-0.452, 0.438), $p = 0.974$], sex [$\beta = -1.574$, 95% CI (-13.459, 10.310), $p = 0.791$], race/ethnicity [$\beta = 3.483$, 95% CI (-9.397, 16.363), $p = 0.590$], age at diagnosis [$\beta = 1.064$, 95% CI (-0.887, 3.015), $p = 0.279$], bicultural acculturation style [$\beta = 1.166$, 95% CI (-11.124, 13.457), $p = 0.850$], and hearing acculturation style [$\beta = -1.845$, 95% CI (-26.593, 22.902), $p = 0.882$].

Summary

Chapter 4 began with a brief review of the problem statement and the research questions and hypotheses in the introduction. Research is limited in understanding BMI and self-efficacy among deaf and hard of hearing adults. Therefore, this study investigated BMI differences between deaf and hard of hearing adults and hearing adults

as well as nutritional and physical activity self-efficacy differences between deaf and hard of hearing adults and hearing adults. This study also investigated the associations between BMI and levels of hearing loss, BMI and deaf acculturation style, self-efficacy (nutritional and physical activity) and levels of hearing loss, and self-efficacy (nutritional and physical activity) and deaf acculturation style among deaf and hard of hearing adults. For the purpose of this research, adults at Gallaudet University were randomly selected and invited to participate in this study via SurveyMonkey. A total of 203 of the 241 respondents were included in the analyses. The sample had a higher proportion of deaf and hard of hearing adults, a higher proportion of deaf and hard of hearing adults with a profound average level of hearing loss, and a higher proportion of adults who identified their race/ethnicity as White. Therefore, this may introduce bias to the study, specifically when evaluating the effects of level of hearing loss and ethnicity/race on the association of average level of hearing loss or deaf acculturation style to obesity or self-efficacy. Hence, the results should be interpreted and generalized with caution. Data collected from the respondents were exported into Microsoft Office Excel and statistically analyzed using IBM SPSS to answer six research questions of this study.

For the analysis of differences in BMI between deaf and hard of hearing adults and hearing adults, an independent-samples *t* test was conducted to evaluate the differences. The result was not significant, $t(78) = -0.285$, $p = 0.777$ with an extremely small-sized effect, $d = 0.059$. Factors of levels of hearing loss and deaf acculturation style were also analyzed as predictors.

For the analysis of associations between BMI and the average level of hearing loss while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis, a multivariate linear regression was conducted. Correlations between BMI and sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss was slightly positive ($R = 0.247$), but not strong. The model had a coefficient of determination [$R^2 = 0.061$], which means 6% of the variability in BMI was explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss. The remaining 94% of the variability may be explained by some other variables that were not included in the study. Further, all of the predictor effects, except for sex and age at diagnosis were not statistically significant and had confidence intervals that included 0: age [$\beta = -0.001$, 95% CI (-0.076, 0.074), $p = 0.979$], race/ethnicity [$\beta = 1.377$, 95% CI (-0.793, 3.539), $p = 0.212$], and average level of hearing loss [$\beta = 0.043$, 95% CI (-1.284, 1.390), $p = 0.938$]. The predictor effects, sex and age at diagnosis, were statistically significant and had confidence intervals that included 0: sex [$\beta = -2.089$, 95% CI (-4.090, -0.080), $p = 0.042$] and age at diagnosis [$\beta = 0.362$, 95% CI (0.005, 0.719), $p = 0.047$].

For the analysis of associations between BMI and deaf acculturation style while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis, a multivariate linear regression was conducted. Correlations between BMI and sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style was slightly positive ($R = 0.292$), but not strong. The model had a coefficient of determination [$R^2 = 0.085$], which means 8.5% of the variability in BMI was explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss. The remaining 91.5% of the variability may

be explained by some other variables that were not included in the study. Further, all of the predictor effects were not statistically significant and had confidence intervals that included 0: age [β = 0.008, 95% CI (-0.070, 0.085), p = 0.845], sex [β = -1.892, 95% CI (-4.048, 0.263), p = 0.085], race/ethnicity [β = 1.301, 95% CI (-1.031, 3.632), p = 0.272], age at diagnosis [β = 0.322, 95% CI (-0.067, 0.711), p = 0.104], deaf acculturation style [β = 3.738, 95% CI (-8.262, 15.738), p = 0.539], bicultural acculturation style [β = 3.901, 95% CI (-8.110, 15.912), p = 0.522], and hearing acculturation style [β = 7.154, 95% CI (-5.296, 19.603), p = 0.258].

For the analysis of differences in self-efficacy between deaf and hard of hearing adults and hearing adults, an independent-samples t test was conducted to evaluate the differences. For differences in nutritional self-efficacy, the result was not significant $t(105) = -0.962$, $p = 0.338$ with a small-sized effect, d = 0.220. For differences in physical activity self-efficacy, the result was also not significant, $t(81) = 0.766$, $p = 0.446$ with a small-sized effect, d = 0.163. Factors of levels of hearing loss and deaf acculturation style were also analyzed as predictors.

For the analysis of associations between self-efficacy and the average level of hearing loss while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis, a multivariate linear regression was conducted. Correlations between nutritional self-efficacy and sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss was slightly positive (R = 0.292), but not strong. The model had a coefficient of determination [R^2 = 0.085], which means 8.5% of the variability in nutritional self-efficacy was explained by sex, race/ethnicity, age, age at diagnosis, or

average level of hearing loss. The remaining 91.5% of the variability may be explained by some other variables that were not included in the study. Further, all of the predictor effects were not statistically significant and had confidence intervals that included 0: age [β = 0.062, 95% CI (-0.290, 0.415), p = 0.726], sex [β = -6.001, 95% CI (-15.528, 3.525), p = 0.213], race/ethnicity [β = -1.300, 95% CI (-11.125, 8.525), p = 0.793], age at diagnosis [β = 1.626, 95% CI (-0.151, 3.402), p = 0.072], and average level of hearing loss [β = -1.691, 95% CI (-7.725, 4.342), p = 0.578]. Correlations between physical activity self-efficacy and sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss was slightly positive (R = 0.172), but not strong. The model had a coefficient of determination [R^2 = 0.029], which means 2.9% of the variability in nutritional self-efficacy was explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss. The remaining 97.1% of the variability may be explained by some other variables that were not included in the study. Further, all of the predictor effects were not statistically significant and had confidence intervals that included 0: age [β = -0.028, 95% CI (-0.494, 0.438), p = 0.905], sex [β = -1.072, 95% CI (-13.248, 11.105), p = 0.860], race/ethnicity [β = 3.455, 95% CI (-9.277, 16.188), p = 0.588], age at diagnosis [β = 1.126, 95% CI (-0.765, 3.016), p = 0.237], and average level of hearing loss [β = 0.241, 95% CI (-7.380, 7.862), p = 0.950].

For the analysis of associations between self-efficacy and deaf acculturation style while controlling for sex, race/ethnicity, age at time of survey, and age at diagnosis, a multivariate linear regression was conducted. Correlations between nutritional self-efficacy and sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style was

slightly positive (R = 0.368), but not strong. The model had a coefficient of determination [R^2 = 0.135], which means 13.5% of the variability in nutritional self-efficacy was explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss. The remaining 86.5% of the variability may be explained by some other variables that were not included in the study. Further, all of the predictor effects were not statistically significant and had confidence intervals that included 0: age [β = 0.051, 95% CI (-0.282, 0.383), p = 0.762], sex [β = -7.209, 95% CI (-16.354, 1.935), p = 0.120], race/ethnicity [β = -1.712, 95% CI (-11.441, 8.017), p = 0.727], age at diagnosis [β = 1.184, 95% CI (-0.613, 2.982), p = 0.193], bicultural acculturation style [β = 9.279, 95% CI (-0.063, 18.622), p = 0.052], and hearing acculturation style [β = 5.102, 95% CI (-17.466, 27.670), p = 0.653]. Correlations between physical activity self-efficacy and sex, race/ethnicity, age, age at diagnosis, or deaf acculturation style was slightly positive (R = 0.176), but not strong. The model had a coefficient of determination [R^2 = 0.031], which means 3.1% of the variability in nutritional self-efficacy was explained by sex, race/ethnicity, age, age at diagnosis, or average level of hearing loss. The remaining 96.9% of the variability may be explained by some other variables that were not included in the study. Further, all of the predictor effects were not statistically significant and had confidence intervals that included 0: age [β = -0.007, 95% CI (-0.452, 0.438), p = 0.974], sex [β = -1.574, 95% CI (-13.459, 10.310), p = 0.791], race/ethnicity [β = 3.483, 95% CI (-9.397, 16.363), p = 0.590], age at diagnosis [β = 1.064, 95% CI (-0.887, 3.015), p = 0.279], bicultural acculturation style [β = 1.166, 95% CI (-11.124, 13.457), p = 0.850], and hearing acculturation style [β = -1.845, 95% CI (-26.593, 22.902), p = 0.882].

In Chapter 5, a discussion of the interpretations of the research data is presented. The discussion begins with confirming or disconfirming the findings by comparing them with what is known in the literature. Further, the discussion will interpret the findings in the context of the social cognitive theoretical framework. This section will be followed by the limitations of this study and a discussion of recommendations for future research. This chapter will conclude with a discussion of the potential social change impact of this study.

Chapter 5: Summary, Conclusion, and Recommendations

Introduction

Among the United States population, trends of obesity have increased over the last three decades, which is placing the population at risk for associated morbidity. Studies on subpopulations such as those with a disability are experiencing greater obesity prevalence (Anderson et al., 2013; Froehlich-Grobe et al., 2013; Weil et al., 2002). Disparities in obesity were evident so much that differences in obesity prevalence are approximately 10% higher among those with a disability compared to those without a disability (Anderson et al., 2013; Froehlich-Grobe et al., 2013). Therefore, people with disabilities including deaf and hard of hearing adults, those without the ability to hear, are at a greater risk of morbidity.

There were gaps in knowledge about the association between obesity and level of hearing loss or deaf acculturation style. At the time of writing, only two published studies addressed the obesity prevalence among deaf and hard of hearing adults, those who are American Sign Language users or have difficulties hearing. Both studies indicated greater obesity prevalence among deaf and hard of hearing adults compared to adults who did not have a disability (Barnett, Klein, et al., 2011; Weil et al., 2002). However, the level of hearing loss and deaf acculturation styles among deaf and hard of hearing were not explicit in these studies. Further, there is limited research in knowledge of associations between obesity and nutritional and physical activity behaviors among deaf and hard of hearing adults. This baseline study of the association between obesity (as assessed with BMI) and hearing loss or level of hearing loss, deaf acculturation style,

and dietary and physical activity behaviors may provide knowledge and understanding in developing and implementing appropriate and adequate obesity interventions for deaf and hard of hearing adults.

This quantitative research was conducted to examine the BMI and nutritional and physical activity self-efficacy differences between deaf and hard of hearing adults and hearing adults, the associations between BMI and levels of hearing loss or deaf acculturation styles, and the association between nutritional and physical activity self-efficacy and levels of hearing loss or deaf acculturation styles. Sample participants were selected randomly at Gallaudet University and recruited through e-mail using SurveyMonkey. The results demonstrated no difference in BMI or nutritional and physical activity self-efficacy between deaf and hard of hearing adults and hearing adults. Further, the results demonstrated no associations between BMI and levels of hearing loss or acculturation style. Also, the results demonstrated no associations between nutritional and physical activity self-efficacy and levels of hearing loss or deaf acculturation style.

Interpretation of the Findings

RQ1 Interpretation of the Findings

Barnett, Klein et al. (2011) and Weil et al. (2002) revealed that deaf and hard of hearing people or people with a hearing loss experience greater obesity prevalence than hearing adults. In this study, the results demonstrated no difference in BMI between deaf and hard of hearing adults and hearing adults. The finding does not align with the research of Barnett, Klein et al. (2011) and Weil et al. (2002). However, Barnett, Klein et al. (2011) reported that the overweight and obese prevalence among deaf and hard of

hearing adults were 0.4% lower and 7.6% higher than the general population. Whereas, Weil et al. (2002) reported that the overweight, mild obesity (BMI: 30.0 – 34.9), moderate obesity (BMI: 35.0 – 39.9), and severe obesity (BMI: ≥ 40.0) prevalence among deaf and hard of hearing adults were 0.1% higher, 4.5% higher, 2.5% higher, and 1.5% greater than those with no disability. In this dissertation study, the overweight and obese prevalence among deaf and hard of hearing adults were 7.2% higher and 1.1% lower than hearing adults. Although, this study's findings do not align with Weil et al.'s (2002) and Barnett, Klein et al.'s (2011) findings and does not demonstrate any significant BMI differences between deaf and hard of hearing adults and hearing adults, it does show that deaf and hard of hearing adults have a higher overweight prevalence than hearing adults.

RQ2 and RQ3 Interpretation of the Findings

In analyzing the association between BMI and levels of hearing loss or acculturation style, the results demonstrated no associations. At the time of writing, there have been no published studies that examined the associations between BMI and levels of hearing loss or acculturation style. Therefore, it is not possible to determine if these findings are consistent.

RQ4 Interpretation of the Findings

In this dissertation study, the researcher compared nutritional self-efficacy and physical activity self-efficacy among deaf and hard of hearing adults and hearing adults. The results demonstrated no difference in nutritional self-efficacy and physical activity self-efficacy between deaf and hard of hearing adults and hearing adults. Studies show

that the social cognitive theoretical (SCT) construct of self-efficacy is consistently related to nutrition and physical activity behavior (Anderson et al., 2007; McAlister et al., 2008; Netz & Raviv, 2004; Patterson et al., 2014; Petosa et al., 2003). In other words, when one increases their self-efficacy, they are more likely to engage in positive behaviors, such as healthy nutrition and physical activity behaviors which can have a positive impact on their weight (Bandura, 1989; Grembowski et al., 1993). Therefore, if there were no BMI differences between deaf and hard of hearing adults and hearing adults, then one would expect no nutritional self-efficacy or physical activity self-efficacy differences between deaf and hard of hearing adults and hearing adults, which was demonstrated in the results.

RQ5 and RQ6 Interpretation of the Findings

In analyzing the association between nutritional self-efficacy or physical activity self-efficacy and levels of hearing loss or acculturation style, the results demonstrated no associations. At the time of writing, there have been no studies that examined the associations between self-efficacy and levels of hearing loss or acculturation style. Therefore, it is not possible to determine if these findings are consistent.

Interpretation of the Findings with the Theoretical Framework

In analyzing the associations between nutritional self-efficacy, physical activity self-efficacy and BMI, the correlations were not significant except the correlation between nutritional self-efficacy and physical activity self-efficacy. Nutritional self-efficacy was negatively correlated with BMI, which does not align with the SCT framework. On the other hand, physical activity self-efficacy was positively correlated

with BMI and nutritional self-efficacy was positively and significantly correlated with physical activity self-efficacy, which aligns with the SCT framework. As one has higher self-efficacy, one is more likely to engage in positive behaviors, including weight loss or effective maintenance of a healthy weight (Anderson et al., 2007; McAlister et al., 2008; Netz & Raviv, 2004; Patterson et al., 2014; Petosa et al., 2003).

Limitations of the Study

There are two threats: internal validity and external validity. Threats to internal validity are associated with the researcher's ability to draw correct inferences from the data about the population (Carlson & Morrison, 2009; Creswell, 2009). Threats to external validity are associated with the researcher's ability to make inferences about the study's results and generalize the results to the population (Carlson & Morrison, 2009; Creswell, 2009). As previously mentioned in Chapter 4, the sample was randomly selected to participate in the study, but many of the participants opted not to complete the survey. The researcher is a member of Gallaudet University, which may have influenced the participants' willingness to participate. The researcher's working relationship at Gallaudet University may also influence the participants' answers to the questions, particularly in reporting weight and height for BMI. Further, as previously mentioned in Chapter 1, there may be inaccurate reporting for BMI and levels of hearing loss due to self-recall bias for those who are answering the survey as honestly as possible. Another limitation of this study was the limited number of hearing participants. The researcher also learned during the data collection that some hearing participants assumed that the survey was for deaf and hard of hearing adults. Despite the researcher's attempts to

increase the sample size of hearing adults, the sample may be biased towards deaf and hard of hearing adults. Also, as described in Chapter 4, the sample was over-represented of the following: deaf and hard of hearing adults, deaf and hard of hearing adults with profound levels of hearing loss, and adults whose race/ethnicity is White. Therefore, this may introduce bias to the study, specifically when evaluating the effects of level of hearing loss and ethnicity/race on the association of average level of hearing loss or deaf acculturation style to obesity or self-efficacy. In addition, the population at Gallaudet University is not representative of the United States population since the percentage of deaf and hard of hearing adults and hearing adults in the U.S. is approximately 2.1% and 98.9% respectively (Harrington, 2014). Therefore, the sample of this study is highly overrepresented of the deaf and hard of hearing adults (73%) and highly underrepresented of the hearing adults, and may explain the negative findings. Finally, the survey was lengthy that it took each participant approximately 30 minutes to complete. Despite clear instructions that the survey would take approximately 45 minutes to complete, some participants quit the survey halfway through. The researcher did not include their responses in the study if the answers attributed to a scale were not 100% completed. As a result of these limitations and the nature of a cross-sectional design, the results are inferable and generalizable only to the sample at the time and place of the data collection. In other words, interpretations and generalizations of these findings are limited to the sample of the study.

Recommendations

The purpose of this study was to examine the BMI and self-efficacy differences among deaf and hard of hearing adults and hearing adults as well as the associations of BMI or self-efficacy and levels of hearing loss or deaf acculturation styles. As indicated, this was an exploratory analysis, and future research should continue to investigate obesity prevalence among deaf and hard of hearing adults.

Recommended alterations should be made to the survey are reducing the length of the survey to avoid survey fatigue and creating a valid and reliable survey in American Sign Language (ASL) for those who may prefer surveys in ASL instead of English. Future studies should include the use of tools that allow accurate measurements of one's height and weight with a physician scale and height rod, body fat with calipers or bod pod also known as air displacement plethysmograph (ADP), and level of hearing loss with an audiometer. By using these tools, the self-report bias for BMI or body fat and level of hearing loss will be reduced. The target population for this study was deaf and hard of hearing adults and hearing adults at Gallaudet University. The majority of the population at Gallaudet University has some college education or has completed at least four years of college and the majority of the population is White. However, the population of deaf or hard of hearing adults may be more racially or ethically diverse and include those who are not college educated and experience additional barriers (i.e. lower SES, limited English skills, and limited access to resources). Variables such as ethnicity, SES, and limited English skills have been shown to impact obesity prevalence (Ogden & Carroll, 2010; Ogden et al., 2014). Therefore, it is recommended to expand the

population to those in the District of Columbia (DC) and outskirts of DC in Maryland and Virginia. In other words, future studies should explore the relationship between obesity prevalence or self-efficacy and the average level of hearing loss or deaf acculturation style in a more diverse population to increase the generalizability of the results.

This study also did not exclude participants who may have other diseases. Many of the drugs used to treat diseases including diabetes, high blood pressure, and depression can cause weight gain (Kyle & Kuehl, n.d.). Therefore, adding questions to the survey about whether they are taking medication and what medications they are taking would allow the researcher to improve its inclusion criteria.

Lastly, the sample size of this study was small, particularly the sample of hearing adults. For future studies, it is recommended to replicate this study with a larger sample size. With a larger sample size, the researcher can conduct studies with higher statistical power. Further, if the larger sample size is representative of the US population, the results can be generalized.

Implications

Social Change Implications

The positive social change implications include an original contribution to research in clarifying the operational definition of deaf and hard of hearing adults while using specific levels of hearing loss and acculturation styles. Results from this study demonstrate that levels of hearing loss or deaf acculturation styles do not have an effect on obesity or self-efficacy. Therefore, other variables aside from levels of hearing loss or deaf acculturation styles have an effect on obesity or self-efficacy. These results have

expanded the knowledge and added to the body of literature on the effects of levels of hearing loss and deaf acculturation styles on obesity prevalence and self-efficacy. Further, these results may serve as a basis for further research and potential development of obesity programs that are geared towards deaf and hard of hearing adults. Obesity programs can be tailored to address deaf and hard of hearing adults of varying hearing levels and acculturation styles.

In addition to the effects of levels of hearing loss and deaf acculturation styles, the results of this study indicated that there are no BMI differences between deaf and hard of hearing and hearing adults. These results differ from other obesity prevalence research among deaf and hard of hearing adults. Despite these differences, the results have expanded the knowledge and added to the body of literature on obesity prevalence among deaf and hard of hearing adults. Also, the results of this study indicated that there are no self-efficacy differences between deaf and hard of hearing adults and hearing adults. No prior study has been published that examined the differences of self-efficacy between deaf and hard of hearing adults and hearing adults. Therefore, the results are an original contribution to research in the knowledge and body of literature on self-efficacy among deaf and hard of hearing adults. In addition, these results may serve as a basis for further research and potential development of obesity programs for deaf and hard of hearing adults. The negative findings of this research suggest that current obesity programs that are in place for hearing adults may be adopted and used for deaf and hard of hearing adults. When adopting current obesity programs for deaf and hard of hearing adults, it

will be crucial to ensure that deaf and hard of hearing adults have access to communication and information.

Recommendation for Practice

From a public health perspective, practitioners and public health education specialists can tailor interventions as appropriate with a better understanding of the obesity prevalence and self-efficacy among deaf and hard of hearing adults. These results of no effects from levels of hearing loss or acculturation styles on obesity can guide practitioners and health education specialists in improving the health of deaf and hard of hearing adults when developing and implementing obesity preventive measures as described earlier.

Conclusion

It was the intent of the researcher to make an original contribution to the knowledge and body of literature on obesity prevalence, nutritional self-efficacy, and physical activity self-efficacy among deaf and hard of hearing adults. Unlike other studies, factors of the level of hearing loss and deaf acculturation styles were examined to understand its associations with BMI, nutritional self-efficacy, and physical activity self-efficacy. While this study did not have any significant findings, there is sufficient reason and evidence as described in the limitations section of this chapter to continue additional research on the obesity prevalence and self-efficacy among deaf and hard of hearing adults.

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Appendix A: Operationalization of Variables

Operationalization of Variables

Variable Type	Variable Name	Variable Source	Potential Responses	Level of Measurement
Dependent	BMI	**Demographic and Personal Survey**		Interval
		Weight	Weight in lbs.	
		Height	Height in inches	
Dependent	Nutrition Social Support	**Healthier-Foods Social Support Scales**		Interval
		fmelfdf family eat low fat dairy foods	1 – 5	
		fmavchps family avoid high fat snacks like chips	1 – 5	
		fmetlfff family eat lower fat foods at fast food places	1 – 5	
		fmslfdne family say lower fat foods dining out	1 – 5	
		fmckloft family cook with very little fat	1 – 5	
		fmdtetbf family don't eat large portions of beef	1 – 5	
		fmscdhfd family said they want to cut down on high fat dairy	1 – 5	
		fmet5day family eat 5 a day	1 – 5	
		fmsctdsw family said want to cut down on sweets		
		famsetlf family said want to eat less fat	1 – 5	
		fmddregs family don't drink many reg sodas	1 – 5	
		fmsetcrf family said want to eat cereal with fiber	1 – 5	
		fmsehfb family said they want to eat higher fiber bread	1 – 5	
		fmefbrce family eat higher fiber cereal	1 – 5	
		fmethfib family eat higher fiber bread	1 – 5	
		fmsetfvg family said want to eat more fruits and vegs	1 – 5	
		famimfbr family believe important to eat more fiber	1 – 5	
Dependent	Nutrition Self-	**Healthier-Foods Efficacy Scales**		Interval

	Efficacy	fb13 switch to low fat ice cream bars	0 – 100	
		fb12 switch to low-fat ice cream	0 – 100	
		fb47 use low fat spreads	0 – 100	
		fb14 eat low-fat cheese	0 – 100	
		fb48 use low fat toppings for potatoes and veg	0 – 100	
		fb51 use low fat or diet salad dressing	0 – 100	
		fb53 avoid eating more than 3 ounces beef in 1 serving	0 – 100	
		fb11 drink 1%, 1/2%, or skim milk	0 – 100	
		fb45 eat pretzels or low fat popcorn for snacks	0 – 100	
		fb54 switch to low fat types of beef	0 – 100	
		fb62 have side salad instead of fries when out	0 – 100	
		fb58 avoid more than 1 serving of beef per day	0 – 100	
		fb22 eat 2 slices of high fiber bread everyday	0 – 100	
		fb21 eat 1 slice of high fiber bread per day	0 – 100	
		fb20 bring slice of high fiber bread for snack	0 – 100	
		fb23 eat 3 slices high fiber bread everyday	0 – 100	
		fb16 eat high-fiber bread for lunch	0 – 100	
		fb24 eat 6 servings of breads and cereals everyday	0 – 100	
		fb18 bring cereal to work or school for snack	0 – 100	
		fb6 bring fruit to school or work	0 – 100	
		fb10 eat veg when I snack	0 – 100	
		fb9 eat fruit when I snack	0 – 100	
		fb36 drink fruit or veg juice at meals	0 – 100	
		fb7 eat 5 servings fruit and veg	0 – 100	
		fb28 eat fruit for dessert instead of sweets	0 – 100	
		fb27 avoid eating sweets or desserts	0 – 100	
		fb25 avoid cookies or snack cakes for snacks	0 – 100	
		fb27x share a dessert in restaurants	0 – 100	
		fb40x cut back on the size of sugared drinks	0 – 100	

		fb30x eat only half a dessert at restaurants	0 – 100	
		fb41 avoid tortilla chips and cheese curls as snacks	0 – 100	
		fb44 eat rice cakes or melba toast when snacking	0 – 100	
		fb46 no more than one high fat salty snack per day	0 – 100	
Dependent	Nutrition Outcome Expectations	**Healthier-Foods Expectations Scales**		Interval
		fb78 I will feel healthier and happier	1 – 5	
		fb83 I will feel better in my clothes	1 – 5	
		fb79 I will live longer	1 – 5	
		fb73 I will have more energy	1 – 5	
		fb86 my health will improve	1 – 5	
		fb88 I will have healthier skin, hair, or teeth	1 – 5	
		fb89 I will be less likely to get cancer	1 – 5	
		fb74 I will lose weight	1 – 5	
		fb92 I will be more attractive	1 – 5	
		fb93 I will be doing what I know I should	1 – 5	
		fb90x I will be bored with what I have to eat	1 – 5	
		fb95x take too long to prepare meals	1 – 5	
		fb94x food will not taste as good	1 – 5	
		fb93x spend too much time keeping track of foods	1 – 5	
		fb96x plan too far in advance	1 – 5	
		fb89x shopping for healthy foods trouble	1 – 5	
		fb87 I will miss eating the foods I love	1 – 5	
		fb100x I won't be able to stick with it	1 – 5	
		fb85 I will be unhappy and irritable	1 – 5	
		fb91x I will have to change a lot of my favorite foods	1 – 5	
		fb82 I will be hungrier	1 – 5	
		fb92x I won't be able to eat the same foods as family	1 – 5	
Dependent	Nutrition Self-Regulation	**Healthier Foods Strategies Scales**		Interval
		ewbi34 plan to eat fewer high fat foods at meals	1 – 5	

		ewbi20 avoid high fat beef	1 – 5	
		ewbi21 eat low fat toppings	1 – 5	
		ewbi10 pay closer attention to serving sizes	1 – 5	
		ewbi3 remind yourself that fat free does not mean calorie free	1 – 5	
		ewbi12 eat smaller portions	1 – 5	
		ewbi23 choose low fat foods in fast food restaurants	1 – 5	
		ewbi1 remind yourself that high fat foods	1 – 5	
		ewbi2 tell yourself that every calorie counts	1 – 5	
		ewbi6 avoid fast food restaurants	1 – 5	
		ewbi17 avoid ice cream and other high fat dairy foods	1 – 5	
		ewbi22 eat low fat salad dressing	1 – 5	
		ewbi5 avoid going to restaurants where you eat to much	1 – 5	
		ewbi4 eat out less often	1 – 5	
		ewbi25 eat no more than 3 snacks a day	1 – 5	
		ewbi31 keep track of higher fiber foods	1 – 5	
		ewbi27 keep track of the number of calories	1 – 5	
		ewbi29 keep track of how many servings of fruit and veg	1 – 5	
		ewbi26 plan to eat only a certain number of calories	1 – 5	
		ewbi30 plan to eat 6 servings of higher fiber food	1 – 5	
		ewbi37 keep track of high fat salty snacks	1 – 5	
		ewbi33 keep track of sweet foods and drinks	1 – 5	
		ewbi8 eat more vegetables	1 – 5	
		ewbi9 eat more fruit	1 – 5	
		ewbi7 eat high fiber foods	1 – 5	
		ewbi28 plan to eat at least 5 servings of fruit and veg	1 – 5	
		ewbi24 eat 3 meals a day	1 – 5	
Dependent	Physical Activity Self-Regulation	**Step-Count Strategies Scale**		Interval
		strat04 plan other places weather bad	1 – 5	
		strat08 take short breaks	1 – 5	

		strat01 set aside time	1 – 5	
		strat10 get together with someone	1 – 5	
		strat09 park farther away	1 – 5	
		strat06 walk instead of drive	1 – 5	
		strat02 take the stairs	1 – 5	
		strat07 find babysitter activity?	1 – 5	
		strat03 write down plans	1 – 5	
		strat05 keep track of steps	1 – 5	
Dependent	Physical Activity Social Support	**Step-Count Social Support/Family Scale**		Interval
		ssfam01 make time to be more physically active	1 – 5	
		ssfam10 take breaks to increase pa	1 – 5	
		ssfam11 use stairs instead of elevator	1 – 5	
		ssfam05 pa helps manage weight	1 – 5	
		ssfam08 say hire babysitter	1 – 5	
		ssfam04 hire babysitter	1 – 5	
		ssfam03 get too hot	1 – 5	
Dependent	Physical Activity Self-Efficacy	**Step-Count Efficacy Scale**		Interval
		paeff13 se change normal routine to increase pa	0 – 100	
		paeff15 se make a plan to increase pa	0 – 100	
		paeff11 se increase step count 500/day 8 wks	0 – 100	
		paeff10 se increase pa during bad weather	0 – 100	
		paeff09 se increase step count 500/day	0 – 100	
		paeff03 se walk to increase step count	0 – 100	
		paeff07 se begin again if miss pa a day or two	0 – 100	
		paeff12 se keep track of steps you are taking	0 – 100	
		paeff08 se park to take more steps	0 – 100	
		paeff06 se take breaks to increase pa	0 – 100	
		paeff02 se get together w someone	0 – 100	
		paeff04 se use stairs not elevator	0 – 100	

		paeff21 se when you have social activities	0 – 100	
		paeff17 se when you are tired	0 – 100	
		paeff18 se when your family wants more time	0 – 100	
		paeff22 se when you have chores or errands	0 – 100	
		paeff20 se when you get busy at work	0 – 100	
		paeff16 se when feeling stressed	0 – 100	
		paeff19 se when you muscles are sore	0 – 100	
		paeff24 se when you are feeling depressed	0 – 100	
		paeff14 se stay up later to make time for pa	0 – 100	
		paeff05 se pa goals first social after	0 – 100	
		paeff23 se when you need a babysitter	0 – 100	
		paeff01 se get up early to increase steps pa	0 – 100	
Dependent	Physical Activity Outcome Expectations	**Step-Count Outcome Scales**		Interval
		paoutv39 feel refreshed	1 – 5	
		paoutv37 sleep better	1 – 5	
		paoutv36 feel better about my body	1 – 5	
		paoutv47 have more energy	1 – 5	
		paoutv28 be happier	1 – 5	
		paoutv41 manage weight better	1 – 5	
		paoutv40 fit into clothes better	1 – 5	
		paoutv29 be less irritable	1 – 5	
		paoutv42 feel less stress	1 – 5	
		paoutv26 doing what's right	1 – 5	
		paoutv44 something to do with family	1 – 5	
		paoutv30 give up normal activities	1 – 5	
		paoutv35 not enough time	1 – 5	
		paoutv31 have to take more time to plan	1 – 5	
		paoutv33 one more thing to worry about	1 – 5	
		paoutv38 less time to spend with family	1 – 5	

		paoutv46 not like my parents/spouse to be deaf.	1 – 5	
		paoutv25 change normal routine	1 – 5	
		paoutv45 less time to spend with friends	1 – 5	
		paoutv32 experience body pain	1 – 5	
		paoutv43 get too sweaty	1 – 5	
		paoutv34 have to buy special shoes	1 – 5	
		paoutv27 wear out shoes too fast	1 – 5	
Independent	Deaf Acculturation Scale (DAS)	**Deaf Acculturation Scale (DASd)**		Interval
		1. I call myself deaf.	1 – 5	
		4. I am comfortable with deaf people.	1 – 5	
		6. I feel that I am part of the deaf world.	1 – 5	
		9. My deaf identity is an important part of who I am.	1 – 5	
		10. Being involved in the deaf world (and with deaf people) is an important part of my life.	1 – 5	
		11. How much do you enjoy going to deaf parties/gatherings?	1 – 5	
		14. How much do you enjoy reading magazines/books written by deaf authors?	1 – 5	
		17. How much do you enjoy watching ASL video-tapes by deaf story-tellers or deaf poets?	1 – 5	
		19. How much do you enjoy going to theater events with deaf actresses/actors?	1 – 5	
		20. How much do you enjoy participating in political activities that promote the rights of deaf people?	1 – 5	
		22. How much do you enjoy attending Deaf-related workshops/conferences (e.g. workshops on Deaf culture or linguistics in ASL)?	1 – 5	
		23. I would prefer my education to be at a deaf school.	1 – 5	
		24. I would prefer it if my roommate was deaf.	1 – 5	
		27. I would prefer that my church/temple is mostly deaf.	1 – 5	

		33. I would prefer my closest friends to be deaf.	1 – 5	
		35. I would prefer my children to be deaf.	1 – 5	
		36. I would prefer my work environment to be deaf.	1 – 5	
		42. How well do you know traditions and customs of deaf schools?	1 – 5	
		43. How well do you know names of deaf heroes or well-known deaf people?	1 – 5	
		44. How well do you know important events in Deaf history?	1 – 5	
		45. How well do you know well-known political leaders in the Deaf community?	1 – 5	
		46. How well do you know organizations run by and for Deaf people?	1 – 5	
		47. How well do you sign using ASL?	1 – 5	
		48. How well do you understand other people signing in ASL?	1 – 5	
		49. When you sign using ASL, how well do other deaf people understand you?	1 – 5	
		50. How well do you finger-spell?	1 – 5	
		51. How well can you read other people's finger spelling?	1 – 5	
		52. How well do you know current ASL slang or popular expressions in ASL?	1 – 5	
Independent	Deaf Acculturation Scale (DAS)	**Hearing Acculturation Scale (DASh)**		Interval
		2. I feel that I am part of the hearing world.	1 – 5	
		3. I call myself hard-of-hearing or hearing-impaired.	1 – 5	
		5. Being involved in the hearing world (and with hearing people) is an important part of my life.	1 – 5	
		7. I am comfortable with hearing people.	1 – 5	
		8. I often wish I could hear better or become hearing.	1 – 5	
		12. How much do you enjoy socializing with hearing people?	1 – 5	

		13. How much do you enjoy attending hearing events/parties/gatherings?	1 – 5	
		15. How much do you enjoy going to theater events with hearing actresses/actors?	1 – 5	
		16. How much do you enjoy participating in hearing political activities?	1 – 5	
		18. How much do you enjoy attending professional workshops in the hearing world?	1 – 5	
		21. How much do you enjoy participating in or attending hearing athletic competitions?	1 – 5	
		25. I would prefer my children to be hearing.	1 – 5	
		26. I would prefer my work environment to be hearing.	1 – 5	
		29. I would prefer to attend a hearing school or mainstreamed program.	1 – 5	
		30. I would prefer my roommate to be hearing.	1 – 5	
		31. I would prefer my closest friends to be hearing.	1 – 5	
		32. I would prefer my partner/spouse to be hearing.	1 – 5	
		34. I would prefer that my church/temple to be mostly hearing.	1 – 5	
		37. How well do you know important events in American/world history?	1 – 5	
		38. How well do you know names of national heroes (hearing)?	1 – 5	
		39. How well do you know names of popular hearing newspapers and magazines?	1 – 5	
		40. How well do you know names of famous hearing actors and actresses?	1 – 5	
		41. How well do you know names of famous hearing political leaders?	1 – 5	

		53. How well do you speak English using your voice?	1 – 5	
		54. In general, how well do hearing people understand your speech?	1 – 5	
		55. How well do you understand other people when they are speaking in English? (i.e. how well do you lip-read?)	1 – 5	
		56. How well do you read English?	1 – 5	
		57. How well do you write English?	1 – 5	
		58. How well do you know English idioms or English expressions?	1 – 5	
Independent	Deaf Accultration Sacle (DAS)	DASd < 3 and DASh >= 3	Hearing Acculturated	Nominal
		DASd < 3 and DASh < 3	Marginal	
		DASd >= 3 and DASh < 3	Deaf Acculturated	
		DASd >= 3 and DASh >= 3	BiCultural	
Independent	Right Ear Hearing Level (dB)	What is your hearing level in your right ear? - Normal (-10 to 15 dB) - Slight (16 to 25 dB) - Mild (26 to 40 dB) - Moderate (41 to 55 dB) - Moderately severe (56 to 70 dB) - Severe (71 to 90 dB) - Profound (91+ dB)	Normal Slight Mild Moderate Moderately Severe Severe Profound	Ordinal
Independent	Left Ear Hearing Level (dB)	What is your hearing level in your left ear? - Normal (-10 to 15 dB) - Slight (16 to 25 dB) - Mild (26 to 40 dB) - Moderate (41 to 55 dB) - Moderately severe (56 to 70 dB)	Normal Slight Mild Moderate Moderately Severe	Ordinal

		- Severe (71 to 90 dB) Profound (91+ dB)	Severe Profound	
Covariate	Age	What is your age?	20 – 99	Ratio
Covariate	Sex	What is your sex?	Male Female	Nominal
Covariate	U.S. Citizen	Are you a U.S. Citizen?	Yes No	Nominal
Covariate	Ethnicity	What is your ethnicity? (Choose one that best applies to you) - American Indian/Alaska Native - Asian - Black/African American - Hispanic of any race - Native Hawaiian/Other Pacific Islander - Two or more - White - Unknown	(See responses on the left)	Nominal

Appendix B: Consent Form

You are invited to participate in a study of obesity prevalence and nutritional and physical activity behaviors. The researcher is randomly selecting and inviting adults aged 20 or older who are current employees or students of Gallaudet University to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to participate.

This study is being conducted by a researcher named Lindsay Buchko, who is a doctoral student at Walden University. You may already know the researcher as the Director of Institutional Research at Gallaudet University, but this study is separate from that role.

Background Information: The purpose of this study is to improve our understanding of the obesity prevalence and nutritional and physical activity behaviors among deaf and hard of hearing adults. Comparisons will be made between deaf or hard of hearing adults and hearing adults, which allow anyone at the age of 20 to participate.

Procedures: If you agree to participate in this study, please read this informed consent form, and respond to the survey questions by clicking on the link at the end of the consent form. The questionnaire will include 9 demographic questions and 164 health belief (nutritional and physical activity behaviors) questions. If you are classified as deaf or hard of hearing based on the demographic questions that you answer, you will have an additional questionnaire of 58 deaf acculturation style questions. You should be able to complete the survey in 45 minutes to an hour. You will need to complete the survey in one sitting.

Confidentiality: Any information you provide will be kept confidential. The researcher will not use your personal information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data will be kept secure by using electronic documents that are password protected, and only the researcher will know the password. Data will be kept for a period of at least 5 years, as required by the university.

Voluntary Nature of the Study: This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at Walden University or Gallaudet University will treat you differently if you decide not to be in the study. If you decide to join the study now, you may change your mind and quit the survey at any time.

Risks and Benefits of Being in the Study: There are no physical risks and no benefits in participating in the study. However, the proposed study may prelude to controlling and improving healthy eating and physical activity behaviors. As a result, emotional changes while completing the questionnaire are a possibility. Participants are not obligated to complete any part of the questionnaire of which they are not comfortable with.

Payment: There will be no payment of any form of compensation for completing the survey.

Contacts and Questions: If you have any questions, you may contact the researcher via e-mail at lindsay.buchko@waldenu.edu. If you have any questions about your right as a participant, the university IRB may be contacted via e-mail at IRB@gallaudet.edu. Gallaudet University's approval number for this study is 2648 and it expires on 09/02/2016.

Please print or save this consent form for your records.

Statement of Consent: I have read the above information, and I understand the study well enough to make a decision to participate. By clicking on the link to the survey below and completing the survey, I consent to participate in the study.

Link to Survey:
http://www.surveymonkey.com/xxxx

Appendix C: Demographic Questionnaire

Demographic Questionnaire

Completion of the demographic questionnaire is significant for determining how each factor influences the results of the study. All of these records will remain confidential. Any reports that may be published will not include any identifying information of the participants of this study. Please answer as appropriate.

1. What is your sex?
   - Female
   - Male

2. What is your age? _____

3. Are you a U.S. Citizen?
   - Yes
   - No

4. What is your ethnicity? (Choose one that best applies to you)
   - American Indian/Alaska Native
   - Asian
   - Black/African American
   - Hispanic of any race
   - Native Hawaiian/Other Pacific Islander
   - Two or more
   - White
   - Unknown

5 What is your height?
Feet _____
Inches _____

6. What is your weight?
Pounds _____

7. What is your hearing level in your right ear?
   - Normal (-10 to 15 dB)
   - Slight (16 to 25 dB)
   - Mild (26 to 40 dB)
   - Moderate (41 to 55 dB)
   - Moderately severe (56 to 70 dB)
   - Severe (71 to 90 dB)

- Profound (91+ dB)

8. What is your hearing level in your right ear?
   - Normal (-10 to 15 dB)
   - Slight (16 to 25 dB)
   - Mild (26 to 40 dB)
   - Moderate (41 to 55 dB)
   - Moderately severe (56 to 70 dB)
   - Severe (71 to 90 dB)
   - Profound (91+ dB)

9. If you are deaf or hard of hearing, at what age did you first lose your hearing? (If you were born deaf or hard of hearing, enter 0. If you lost your hearing a few months after you were born, enter the number of months next to months, otherwise enter the age you first lost your hearing next to years).

____ years ____ months

Appendix D: Health Beliefs Survey Permission

Permission to Use of Health Beliefs Survey

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Center for Research in Health Behavior
Department of Psychology
Mail Code 0436
Blacksburg, Virginia 24061

3/27/2015

Dear Lindsay Buchko,

Regarding the Health Beliefs Survey, you have my permission to a) use the survey instrument and b) reproduce the instrument and include it as an appendix for your dissertation.

Best,

Eileen A Bill

Eileen Smith Anderson Bill, Ed.D.
Research Assistant Professor
Center for Research in Health Behavior (0436)
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Appendix E: Health Beliefs Survey Questionnaire

Health Beliefs Survey Questionnaire

These questions ask about what you do and think about eating healthier foods. It also asks about what the members of your family and your friends do and think about eating healthy foods. I just want your opinion even if you are not sure.

Food Beliefs
Healthier Food Social Support

Use this scale to tell us if you agree with the following statements:

1 Strongly Disagree *2* *3* *4* *5 Strongly Agree*

My family, and my closest friends …	*Agree or Disagree 1-5*	
	Family	*Friends*
1. say they try to eat lower-fat foods when dining out.		
2. believe it's important to eat enough fiber.		
3. have told me they want to eat less fat.		
4. have told me they want to cut down on high-fat dairy foods.		
5. eat higher-fiber cereal every day.		
6. don't drink many regular sodas or sugared drinks.		
7. eat 5 servings of fruits and vegetables every day.		
8. avoid high-fat snacks like chips and snack crackers.		
9. try to eat low-fat dairy foods.		
10. don't eat large portions of beef.		
11. eat higher-fiber bread every day.		
12. have told me they want to eat more fruits and vegetables.		
13. have told me they want to eat cereal with fiber.		
14. have told me they want to cut down on sweets.		
15. cook with very little fat.		

Use this scale to tell us if you agree with the following statements:

1	*2*	*3*	*4*	*5*
Strongly Disagree				*Strongly Agree*

My family, and my closest friends …	*Agree or Disagree 1-5*	
	Family	*Friends*
16. eat lower-fat foods at fast-food restaurants.		
17. have told me they want to eat higher-fiber bread.		

Food Beliefs
Healthier-Foods Strategies

These questions ask about what you have done in the past 3 months to eat healthier foods.

Use this scale to tell us how often in the past 3 months you did the following:

1	2	3	4	5
Never	*Seldom*	*Occasionally*	*Often*	*Repeatedly*

In the past 3 months how often did you:	*How Often (1-5)*
1. Remind yourself that high-fat foods have more calories than low-fat foods.	
2. Tell yourself that every calorie counts.	
3. Remind yourself that “fat-free” does not mean “calorie-free.”	
4. Eat out less often.	
5. Avoid going to restaurants where you eat too much.	
6. Avoid fast-food restaurants.	
7. Eat high-fiber foods.	
8. Eat more vegetables.	

Use this scale to tell us how often in the past 3 months you did the following:

1 *Never*	2 *Seldom*	3 *Occasionally*	4 *Often*	5 *Repeatedly*

In the past 3 months how often did you:	*How Often (1-5)*
9. Eat more fruit.	
10. Pay closer attention to serving sizes.	
11. Keep track of how many high-fat foods you eat each day.	
12. Eat smaller portions.	
13. Avoid ice cream and other high-fat dairy foods.	
14. Avoid high-fat beef.	
15. Eat low-fat toppings for potatoes and other vegetables.	
16. Eat low-fat salad dressing.	
17. Choose low-fat foods in fast-food and other restaurants.	
18. Eat 3 meals a day.	
19. Eat no more than 3 snacks a day.	
20. Plan to eat only a certain number of calories a day.	
21. Keep track of the number of calories you eat each day.	
22. Plan to eat at least 5 servings of fruits and vegetables each day.	
23. Keep track of how many servings of fruits and vegetables you eat each day.	
24. Plan to eat 6 servings of higher-fiber food each day.	
25. Keep track of how many servings of higher-fiber foods you eat each day.	

Use this scale to tell us how often in the past 3 months you did the following:

1 *Never*	2 *Seldom*	3 *Occasionally*	4 *Often*	5 *Repeatedly*

In the past 3 months how often did you:	*How Often (1-5)*
26. Plan to eat fewer high-fat foods at meals.	
27. Keep track of how many sweet foods and drinks you have each day.	
28. Keep track of how many servings of high-fat salty snacks you eat each day.	

Food Beliefs
Healthier-Foods Efficacy

These questions ask how CERTAIN you are that you can do different things to eat healthier foods. You will be asked to decide how certain or how sure you are that you can do these things on most days and in lots of different situations. Think about times when it will be easy to do these things and when it will be harder. When deciding how sure you are you can do these things, I want you to think about doing them:

ALL or MOST of the time, not just once or twice.
For a long time…until next year…or even longer!
In a lot of different situations - like when you are …

- deciding what to eat when at home, alone, watching TV or doing chores…
- eating with your family…
- eating out with friends or at a party…
- at a fast-food restaurant…
- buying food at the grocery store

Use any number from 0 to 100 on the following scale to tell how certain you are that you can - all or most of the time:

0 ---------- 50 ---------- 100
Certain I CAN NOT *Somewhat certain I can* *Certain I CAN*

How certain are you that you can …	*How certain? (0-100)*
FRUITS AND VEGETABLES	
1. bring fruit to work or school for a snack every day?	
2. eat at least 5 servings of fruits and vegetables every day?	
3. eat vegetables (like carrot or celery sticks) for a snack?	
4. eat fruit for a snack?	
5. have a side salad instead of French fries when dining out?	
6. drink fruit or vegetable juice at meals?	
DAIRY FOODS	
7. drink 1%, ½%, or fat-free (skim) milk?	
8. switch to low-fat or fat-free ice cream or frozen yogurt?	
9. switch to low-fat or fat-free ice cream bars?	
10. eat low-fat cheese?	
BREADS AND CEREALS	
11. eat higher-fiber bread for lunch?	
12. bring higher fiber cereal to work or school for a snack?	
13. bring a slice of higher-fiber bread to work or school for a snack?	
14. eat 1 slice of higher-fiber bread every day?	
15. eat 2 slices of higher-fiber bread every day?	
16. eat at least 3 slices of higher-fiber bread every day?	
17. eat at least 6 servings of higher-fiber breads and cereals a day?	

0 ---------- 50 ---------- 100
Certain I CAN NOT *Somewhat certain I can* *Certain I CAN*

How certain are you that you can …	*How certain? (0-100)*
SWEETS	
18. avoid eating cookies or snack cakes for snacks?	
19. share a dessert in a restaurant?	
20. avoid eating sweets for dessert?	
21. eat fruit for dessert instead of sweets?	
22. eat half a dessert in a restaurant and take the rest home?	
23. cut back on the size of sodas and sugared drinks?	
SALTY SNACKS	
24. avoid eating tortilla chips or cheese curls as snacks?	
25. eat rice cakes or Melba toast for a snack?	
26. eat pretzels or low-fat popcorn for snacks?	
27. stick to eating no more than ONE high-fat salty snack every day?	
TOPPINGS	
28. use low-fat spreads on bread?	
29. use low-fat toppings for potatoes and other vegetables?	
30. use low-fat or diet salad dressing?	
BEEF	
31. switch to low-fat types of beef (90% fat-free)?	
32. avoid eating more than 3 ounces of cooked beef in one serving?	
33. avoid eating more than 1 serving of beef a day?	

Food Beliefs
Healthier-Foods Outcomes

Now, tell me what you expect will happen when you eat healthier foods.
Use this scale to tell us if you agree the following will happen:

1 *2* *3* *4* *5*
Strongly Disagree *Strongly Agree*

If I eat healthier foods every day, I expect:	*Do you agree? (1-5)*
1. I will have more energy.	
2. I will lose weight.	
3. I will feel healthier and happier.	
4. I will live longer.	
5. I will feel better in my clothes.	
6. I will be hungrier.	
7. I will be unhappy and irritable.	
8. My health will improve.	
9. I will miss eating the foods I love.	
10. I will have healthier skin, hair, or teeth.	
11. I will be less likely to get cancer or heart disease.	
12. Shopping for healthy foods will be a lot of trouble.	
13. I will be bored with what I have to eat.	
14. I will have to change a lot of my favorite foods.	
15. I won't be able to eat the same foods as the rest of my family.	
16. I will have to spend too much time keeping track of what I eat.	
17. The food I eat will not taste good.	
18. It will take too long to prepare meals and snacks.	
19. I will have to plan my meals too far in advance.	
20. I will be more attractive.	

Use this scale to tell us if you agree the following will happen:

1 *2* *3* *4* *5*
Strongly Disagree *Strongly Agree*

If I eat healthier foods every day, I expect:	*Do you agree? (1-5)*
21. I will be doing what I know I should.	
22. I won't be able to stick with it – I'll just go back to my old habits.	

Physical Activity Beliefs
Step-Count Strategies

Using a step-counter to help you slowly and steadily increase the number of steps you take each day is a good way to increase your physical activity. This means taking 500 extra steps a day, each week for several weeks - or 500 extra daily steps the first week, then adding 500 daily steps again the second week and so on. After steadily increasing your daily steps for several weeks, you would then maintain your new higher daily step-count!

This survey asks about what you do and think about increasing your daily step-count or physical activity. It also asks about what the members of your family and your friends do and think about increasing their physical activity or daily step-count. I just want your opinion even if you are not sure.

Physical Activity Beliefs
Step-Count Social Support

Use this scale to tell us if you agree with the following statements:

1 2 3 4 5
Strongly Disagree *Strongly Agree*

My family and my closest friends …	*Agree or Disagree 1-5*	
	Family	*Friends*
1. make time to be more physically active.		
2. find or hire a babysitter so they can increase their physical activity.		

Use this scale to tell us if you agree with the following statements:

1	2	3	4	5
Strongly Disagree				*Strongly Agree*

My family and my closest friends …	*Agree or Disagree 1-5*	
	Family	*Friends*
3. believe being physically active helps them manage their weight.		
4. have said they will find or hire a babysitter so they can increase their physical activity.		
5. are not more physically active because they get too hot.		
6. take short breaks to be physically active during the day.		
7. use the stairs at work or school instead of an elevator.		

Physical Activity Beliefs
Step-Count Strategies

These questions ask about what strategies you have used in the past 3 months to increase your daily step-count or physical activity.

Use this scale to tell us how often in the past month you did the following:

1	2	3	4	5
Never	*Seldom*	*Occasionally*	*Often*	*Repeatedly*

In the past month how often did you:	*How Often (1-5)*
1. Set aside time each day to increase your daily step-count or physical activity?	
2. Take the stairs instead of an elevator?	
3. Write down in your calendar each week your plans to increase your daily step-count or physical activity?	
4. Plan other places to increase your daily step-count or physical activity if the weather is bad?	

Use this scale to tell us how often in the past month you did the following:

1	2	3	4	5
Never	*Seldom*	*Occasionally*	*Often*	*Repeatedly*

In the past month how often did you:	*How Often (1-5)*
5. Keep track of how many steps you are taking?	
6. Walk instead of drive when going out for lunch or doing errands?	
7. Find or hire a babysitter so you can increase your daily step-count or physical activity?	
8. Take short breaks to increase your daily step-count or physical activity during the day?	
9. Park farther away from school or work to increase your daily step-count or physical activity?	
10. Get together with someone else to increase your step-count or physical activity?	

Physical Activity Beliefs
Step-Count Efficacy

These questions ask how CERTAIN you are that you can do different things to increase your physical activity by:

building up your daily step-count.

You will be asked to decide how certain or how sure you are that you can "slowly and steadily build up your daily step-count" on most days and in lots of different situations.

Think about times when it will be easy to build up your step-count and when it will be harder.

When deciding how sure you are, we want you to think about increasing your step-count or physical activity…

EVERY DAY or ALMOST EVERY DAY, not just once or twice.
For a long time…until next year…or even longer!
In a lot of different situations - like when you are …

- at work or school…
- when the weather is bad…

- when you are feeling stressed or depressed…
- when you can't find someone to increase your daily step-count with you…
- when you are busy.

Use any number from 0 to 100 on the following scale to tell how certain you are that you can – all or most of the time:

0 ---------- 50 ---------- 100
Certain I CAN NOT *Somewhat certain I can* *Certain I CAN*

How certain are you that you can …	*How certain? (0-100)*
1. get up early during the week to build up your daily step-count?	
2. get together with someone else to increase your step-count?	
3. walk as a way to increase your daily step-count?	
4. use the stairs at work or school instead of the elevator?	
5. go to social events or fun activities only after reaching your daily step-count goal?	
6. take small breaks during the day to increase your daily step-count?	
7. begin increasing your step-count again if you miss a day or two?	
8. park farther away to take more steps?	
9. each week, increase your daily step-count by 500 steps?	
10. find a place to increase your daily step-count during bad weather?	
11. increase your daily step-count by 500 steps, each week for 8 weeks?	
12. keep track of how many steps you are taking?	

Use any number from 0 to 100 on the following scale to tell how certain you are that you can – all or most of the time:

0 ---------- 50 ---------- 100

Certain I CAN NOT — *Somewhat certain I can* — *Certain I CAN*

How certain are you that you can …	*How certain? (0-100)*
13. change your normal routine to increase your daily step count?	
14. stay up later to make time for building up your daily step-count?	
15. make a plan to increase your daily step-count?	
How certain are you that you can increase your daily step-count when …	
16. you are feeling stressed?	
17. you are tired?	
18. your family wants more time?	
19. your muscles might be a little sore?	
20. you get busy at work?	
21. you have social activities?	
22. you have chores or errands to do?	
23. you need a babysitter to do so?	
24. you are feeling depressed?	

Physical Activity Beliefs
Step-Count Outcomes

These questions ask about what you expect will happen *if you were to slowly and steadily increase your daily step count or physical activity.* They also ask about how much it would matter to you for these things to happen.

Use this scale to tell us if you agree the following will happen:

1	2	3	4	5
Strongly Disagree				*Strongly Agree*

Use this scale to tell us how much it will matter:

1	2	3	4	5
It will not matter at all				*It will matter very much*

If I slowly and steadily build up my daily step count I will …	*Do you agree? (1-5)*	*Will it matter? (1-5)*
25. have to change my normal routine.		
26. be doing what is right for me.		
27. wear out my shoes too fast.		
28. be happier.		
29. be less irritable.		
30. experience body pain.		
31. have one more thing to worry about getting done.		
32. feel better about my body.		
33. sleep better.		
34. have less time to spend with my family.		
35. feel refreshed.		
36. have to buy special walking shoes.		

Use this scale to tell us if you agree the following will happen:

1	2	3	4	5
Strongly Disagree				*Strongly Agree*

Use this scale to tell us how much it will matter:

1	2	3	4	5
It will not matter at all				*It will matter very much*

If I slowly and steadily build up my daily step count I will …	*Do you agree? (1-5)*	*Will it matter? (1-5)*
37. not have enough time for other things I want to do.		
38. fit into my clothes better.		
39. manage my weight better.		
40. have to give up some of my normal activities.		
41. have to take more time than usual to plan my day.		
42. feel less stress.		
43. get too sweaty.		
44. have something I can do with my family.		
45. have less time to spend with my friends.		
46. not like all the extra walking.		
47. have more energy.		

Appendix F: Deaf Acculturation Scale (DAS) Survey Permission

Permission to Use of Deaf Acculturation Scale (DAS) Survey

GALLAUDET
UNIVERSITY
DEPARTMENT OF PSYCHOLOGY

3/27/15

To: Lindsay Buchko
From: Deborah Maxwell-McCaw, Ph.D.

I am writing this letter to give formal permission for you to use the Deaf Acculturation Scale (DAS-58) as part of your dissertation study. You also have my permission to reproduce the instrument and include it as an appendix in your final copy of the dissertation, just so long as full credit is given to myself and my co-author (Maria C. Zea). We wish you every success in your study!

Sincerely –

Deborah Maxwell-McCaw, Ph.D.

The citation for your reference:
Maxwell-McCaw, D., & Zea, M.C. (2011). The Deaf Acculturation Scale (DAS): Development and validation of a 58-item measure. *Journal of Deaf Studies and Deaf Education*. doi: 10.1093/deafed/enq061.

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Appendix G: Deaf Acculturation Scale (DAS) Questionnaire

Deaf Acculturation Scale (DAS) Questionnaire

Instructions:
You will be asked to answer several questions about yourself. This should not take more than a half hour of your time. There are no right or wrong answers to the questions so please answer them as honestly and accurately as possible.

CULTURAL IDENTIFICATION

The following section contains questions about your involvement in the deaf and hearing world. Please check (√) the number that best corresponds to your answer.

1	2	3	4	5
Strongly Disagree	*Disagree*	*Agree Sometimes*	*Agree*	*Strongly Agree*

1. I call myself Deaf.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

2. I feel that I am part of the hearing world.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

3. I call myself hard-of-hearing or hearing-impaired.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

4. I am comfortable with deaf people.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

5. Being involved in the hearing world (and with hearing people) is an important part of my life.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

6. I feel that I am part of the deaf world.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

7. I am comfortable with hearing people.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

8. I often wish I could hear better or become hearing.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

9. My deaf identity is an important part of who I am.

   1 ___ 2 ___ 3 ___ 4 ___ 5 ___

10. Being involved in the deaf world (and with deaf people) is an important part of my life.

    1 ___ 2 ___ 3 ___ 4 ___ 5 ___

ENJOYMENT/LIKING

Please answer the questions below using the following responses:

1	2	3	4	5
Not at all		Somewhat		A great deal

HOW MUCH DO YOU ENJOY:

11. Going to deaf parties/gatherings?

    1 ___ 2 ___ 3 ___ 4 ___ 5 ___

12. Socializing with hearing people?

    1 ___ 2 ___ 3 ___ 4 ___ 5 ___

13. Attending hearing events/parties/gatherings?

    1 ___ 2 ___ 3 ___ 4 ___ 5 ___

14. Reading magazines/books written by deaf authors.

    1 ___ 2 ___ 3 ___ 4 ___ 5 ___

15. Going to theater events with hearing actresses/actors.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

16. Participating in hearing political activities.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

17. Watching ASL video-tapes by deaf story-tellers or deaf poets.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

18. Attending professional workshops in the hearing world.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

19. Going to theater events with deaf actresses/actors.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

20. Participating in political activities that promote the rights of deaf people.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

21. Participating in or attending hearing athletic competitions.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

22. Attending Deaf-related workshops/conferences (e.g., workshops on Deaf culture or linguistics in ASL)

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

CULTURAL PREFERENCES

Instructions: Sometimes life is not really as we want it. If you could have it your way, how would you prefer the following situations in your life to be like? Please answer the questions below using the following responses:

1	2	3	4	5
Strongly Disagree	*Disagree*	*Agree Sometimes*	*Agree*	*Strongly Agree*

23. I would prefer my education to be at a deaf school.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

24. I would prefer it if my roommate was deaf.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

25. I would prefer my children to be hearing.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

26. I would prefer my work environment to be hearing.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

27. I would prefer that my church/temple is mostly deaf.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

28. I would prefer my partner/spouse to be deaf.
1 ___ 2 ___ 3 ___ 4 ___ 5 ___

29. I would prefer to attend a hearing school or mainstreamed program.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

30. I would prefer my roommate to be hearing.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

31. I would prefer my closest friends to be hearing.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

32. I would prefer my partner/spouse to be hearing.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

33. I would prefer my closest friends to be deaf.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

34. I would prefer that my church/temple to be mostly hearing.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

35. I would prefer my children to be deaf.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

36. I would prefer my work environment to be deaf.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

CULTURAL KNOWLEDGE

Please answer the questions below using the following responses:

1	2	3	4	5
Not at all	*A little*	*Pretty Good/ Average*	*Very Good*	*Excellent/ Like a Native*

HOW WELL DO YOU KNOW:

37. Important events in American/world history

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

38. Names of national heroes (hearing)

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

39. Names of popular hearing newspapers and magazines

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

40. Names of famous hearing actors and actresses

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

41. Names of famous hearing political leaders

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

42. Traditions and customs of deaf schools

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

43. Names of deaf heroes or well-known deaf people.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

44. Important events in Deaf history.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

45. Well-known political leaders in the Deaf community.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

46, Organizations run by and for Deaf people.

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

LANGUAGE COMPETENCE

Please answer the questions below using the following responses:

1	2	3	4	5
Not at all	*A little*	*Pretty Good/ Average*	*Very Good*	*Excellent/ Like a Native*

47. How well do you sign using ASL?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

48. How well do you understand other people signing in ASL?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

49. When you sign using ASL, how well do other deaf people understand you?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

50. How well do you finger-spell?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

51. How well can you read other people's finger spelling?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

52. How well do you know current ASL slang or popular expressions in ASL?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

53. How well do you speak English using your voice?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

54. In general, how well do hearing people understand your speech?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

55. How well do you understand other people when they are speaking in English? (i.e., how well do you lip-read?)

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

56. How well do you read English?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

57. How well do you write in English?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___

58. How well do you know English idioms or English expressions?

1 ___ 2 ___ 3 ___ 4 ___ 5 ___