
**Relationship between Cognitive Anxiety Level
and Client Variables at First Consultation
for Adults with Hearing Impairment**

Dianne C. Parry

A thesis submitted in partial fulfilment
of the requirements for the Degree of
Master of Audiology
at the University of Canterbury

2013

Acknowledgements

First and foremost, I wish to thank my primary supervisor, Dr Rebecca Kelly-Campbell, for her knowledge, encouragement, and support throughout the thesis process, and in particular, the many hours she dedicated to helping me with this project. Thank you also to my secondary supervisor, Dr Donal Sinex, for the time spent proof-reading and the feedback provided. I would also like to thank the staff at the audiology clinic involved in this study, who assisted with data collection and participant recruitment. Without their help, and the help of the participants, this study would not have been possible.

Sincere thanks goes to my family and friends who have been there for me during the good times and bad. A special thank you goes to my wonderful classmates, who made the last two years fun despite the stress, whether university- or earthquake-related. We made it out alive.

Abstract

Hearing impairment (HI) is a growing health issue in today's ageing society. Research has suggested that individuals with HI may experience increased levels of anxiety. Previous research has mainly focused on anxiety as a trait; recent research, however, has looked at state anxiety in the hearing impaired population. Cognitive anxiety is a state anxiety that occurs when people encounter a situation which does not lie within their construct system. As a result, they may experience anxiety as they are unable, or only partially able, to interpret the event meaningfully and are therefore unable to judge the implications of this event. The following study aimed to use the Cognitive Anxiety Scale to investigate relationships between cognitive anxiety and client variables in hearing impaired individuals, adding to the small amount of research currently available in this area. The following research questions were investigated: (1) Is there a relationship between cognitive anxiety level and (a) age, (b) gender, (c) audiometric variables, and (d) quality of life? (2) Is there a significant difference between the level of cognitive anxiety for the participants who purchased and kept hearing aids and those who did not? Twenty-five hearing impaired individuals who were consulting an audiologist for the first time participated in this study, with the cognitive anxiety interview conducted prior to the audiological assessment. The results indicated that cognitive anxiety was significantly related to an ability to understand speech in noise and quality of life, and that hearing aid adopters exhibited greater levels of cognitive anxiety than non-adopters. These results confirm that cognitive anxiety is indeed experienced by adults with HI, and suggest that it may be a factor which motivates people to adopt hearing aids. Further research is needed to confirm and further investigate the relationships with client variables. By listening for signs of cognitive anxiety, an audiologist may be able to gauge if a client is ready for rehabilitation, and encourage the process by exploring the effects of HI on

communication situations, employing speech in noise testing, and including the significant other in the process.

Table of Contents

Abstract.....	i
Table of Contents	iii
List of Figures.....	vi
List of Tables	vii
Chapter One: Introduction	1
1.1 Overview	1
1.2 Hearing Impairment	3
1.2.1 Overview	3
1.2.2 Prevalence.....	4
1.2.3 Impact of hearing impairment	4
1.2.3.1 The impact of health conditions	5
1.2.3.2 Measurement of the impact of hearing impairment	7
1.2.3.3 Quality of life and hearing impairment	9
1.2.4 Adjustment to hearing impairment	12
1.2.5 Effect of hearing aid adoption on the impact of hearing impairment.....	14
1.2.5.1 Factors influencing help-seeking	15
1.2.5.2 Factors influencing hearing aid adoption	15
1.2.5.3 Benefit of hearing aid adoption.....	19
1.3 Anxiety and Hearing Impairment.....	21
1.3.1 Relationship between anxiety, hearing impairment and age	23
1.3.2 Relationship between anxiety, hearing impairment and gender.....	25
1.3.3 Relationship between anxiety, hearing impairment and quality of life	26
1.4 Cognitive Anxiety	27
1.4.1 George Kelly’s Personal Construct Theory.....	28
1.4.2 The Cognitive Anxiety Scale.....	29
1.4.3 Use of the Cognitive Anxiety Scale in the communication disorders	31
1.5 Rationale	33
1.6 Aims and Hypotheses.....	33
Chapter Two: Method	35
2.1 <i>A Priori</i> Power Analysis	35
2.2 Participants	35
2.3 General Procedure	37
2.4 Measures	38
2.4.1 Level of cognitive anxiety	38

2.4.2 Audiometric variables.....	40
2.4.2.1 Hearing impairment	41
2.4.2.2 Speech in quiet	41
2.4.2.3 Speech in noise.....	41
2.4.3 Quality of life.....	43
2.5 Statistical Methods	44
2.6 Ethical Considerations	45
Chapter Three: Results	46
3.1 Reliability of Coding	46
3.2 Sample Characteristics	47
3.3 Correlations	48
3.4 Mann-Whitney U tests	52
3.4.1 Gender	52
3.4.2 Hearing aid adoption	53
3.5 Chi-square	54
Chapter Four: Discussion	56
4.1 Relationship between Cognitive Anxiety Level and Age	56
4.2 Relationship between Cognitive Anxiety Level and Gender	58
4.3 Relationship between Cognitive Anxiety Level and Audiometric Variables	60
4.4 Relationship between Cognitive Anxiety Level and Quality of Life.....	62
4.5 Relationship between Cognitive Anxiety Level and Hearing Aid Adoption.....	64
4.6 Other Findings.....	65
4.6.1 Relationships between audiometric variables.....	65
4.6.2 Relationship between audiometric and demographic variables	66
4.6.3 Relationship between audiometric variables and quality of life.....	68
4.6.4 Relationship between audiometric variables and hearing aid adoption	70
4.6.5 Relationship between quality of life and demographic variables.....	71
4.6.6 Relationship between quality of life and hearing aid adoption	72
4.6.7 Relationship between hearing aid adoption and demographic variables.....	72
4.7 Clinical Implications	74
4.8 Limitations and Directions for Future Research	76
4.9 Conclusion.....	77
References.....	78
Appendix A – Information Sheet.....	I
Appendix B – Consent Form.....	III
Appendix C – Hearing Handicap Inventory for the Elderly	IV
Appendix D – Hearing Handicap Inventory for Adults	VI

Appendix E – Examples of Cognitive Anxiety	VIII
---	-------------

List of Figures

<i>Figure 1.</i> Model showing the interaction between ICF components (World Health Organization, 2001).....	6
<i>Figure 2.</i> Guidelines for scoring clauses (Kelly et al., 2011)	39
<i>Figure 3.</i> Cognitive Anxiety Scale formula (Viney & Westbrook, 1976).....	40
<i>Figure 4.</i> Comparison of CAS scores between first and second coders	47
<i>Figure 5.</i> Age plotted against CAS score for all participants	49
<i>Figure 6.</i> BEPTA plotted against CAS score for all participants	50
<i>Figure 7.</i> WRS score plotted against CAS score for all participants.....	50
<i>Figure 8.</i> SNR loss plotted against CAS Score for 17 participants	51
<i>Figure 9.</i> HHI score plotted against CAS score for all participants	51
<i>Figure 10.</i> CAS score for each participant within the male and female groups	53
<i>Figure 11.</i> CAS score for each participant within the adopter and non-adopter groups	54

List of Tables

Table 1: Criteria for Defining Clauses (Kelly et al., 2011)	39
Table 2: Cognitive Anxiety Categories and Weights	40
Table 3: Descriptive Statistics for the Total Sample	47
Table 4: Correlation Matrix between CAS Score, Age, BEPTA, WRS, SNR loss, and HHI Variables	49
Table 5: Results of Mann-Whitney U Tests for Comparison between Genders.....	52
Table 6: Results of Mann-Whitney U Tests for Comparison between Hearing Aid Adopters (A) and Non-Adopters (NA).....	54
Table 7: Examples of Cognitive Anxiety.....	VIII

Chapter One: Introduction

1.1 Overview

With the ageing population, hearing impairment (HI) is a growing health issue in today's society with 364 million people worldwide estimated to have a mild HI, and a further 278 million people estimated to have a disabling HI (World Health Organization, 2006). HI has been found to impact on an individual in a multitude of ways, including decreased participation in social activities (Helvik, Jacobsen, Wennberg, et al., 2006; Hickson et al., 2008), reduced quality of life (QoL: Dalton et al., 2003; Hallberg, Hallberg, & Kramer, 2008; Hickson et al., 2008) and difficulties at work (Jennings & Shaw, 2008; Sataloff, Sataloff, Virag, Sokolow, & Luckhurst, 2006). Measurement of the impact of HI, and in particular hearing handicap, is an important part of the audiological assessment and can signal to the audiologist whether the client is ready for amplification or other rehabilitation strategies (Chang, Ho, & Chou, 2009; Fischer et al., 2011; Garstecki & Erler, 1998; Gopinath et al., 2011; Helvik, Jacobsen, Wennberg, et al., 2006; Hogan et al., 2001). Studies have demonstrated the positive effect of hearing aids, such as increased QoL following fitting (Kochkin, 2011; Öberg, Marcusson, Nägga, & Wressle, 2012), and better relationships at home and at work (Kochkin, 2011).

Along with the effects mentioned above, individuals with HI may also experience increased levels of anxiety. While some research has supported this argument (Kent & La Grow, 2007; Mehta et al., 2003), others have not demonstrated this relationship (Nachtegaal et al., 2009) or have shown anxiety to be a factor only for a certain type of HI (Tambs, 2004). Thus, there is conflicting information relating to anxiety in the hearing impaired population. Research relating to other variables such as age (Nachtegaal et al., 2009; Tambs, 2004),

gender (Andersson & Green, 1995; Garstecki & Erler, 1999; Hallberg et al., 2008; Helvik, Jacobsen, & Hallberg, 2006a; Nachtegaal et al., 2009), and QoL are scarce and results also mixed.

Rather than focusing on anxiety as a trait, recent research has looked at state anxiety in the hearing impaired population. Cognitive Anxiety is based upon George Kelly's (1955) Personal Construct Theory (PCT), whereby the author viewed people as incipient scientists: they endeavour to develop 'constructs' about the events in their lives in order to understand and predict how these events will progress. Following from this, Viney and Westbrook (1976) stated that cognitive anxiety occurs when people encounter a situation which does not lie within their construct system. As a result, they may experience anxiety as they are unable, or only partially able, to interpret the event meaningfully and are therefore unable to judge the implications of this event. Viney and Westbrook (1976) developed the Cognitive Anxiety Scale (CAS) as a means to measure this cognitive anxiety.

The following study aims to use the CAS to investigate relationships between cognitive anxiety and client variables in hearing impaired individuals, adding to the small amount of research currently available in this area. The following chapter provides an overview on HI, the effects to the individual, and factors relating to acceptance of a HI. Also discussed are the factors involved in help-seeking and hearing aid adoption, along with the benefits received from use of hearing aids. Anxiety and its relationship to HI will also be addressed, along with cognitive anxiety and its foundations in PCT. Use of the CAS in the field of communication disorders will be discussed before the rationale for the investigation and the aims and the hypotheses are described.

1.2 Hearing Impairment

1.2.1 Overview

A hearing impairment (HI) is present if an individual's hearing sensitivity to frequency and/or intensity is impaired (Bagai, Thavendiranathan, & Detsky, 2006).

Audiometry is undertaken to establish the lowest level, in dB HL, at which an individual responds to a pure tone stimulus, typically at octave frequencies between 500 and 8000 Hz.

The HI is described in terms of its type, magnitude, and configuration. Type refers to the general site of lesion. If the place of impairment is located in the outer or middle ear, the HI is referred to as 'conductive'. This type of impairment results from a disruption of the transmission in sound to the inner ear, and can often be corrected through medical or surgical management. If, however, the HI is a result of cochlear or neural damage, the HI is labelled 'sensorineural'. This is typically a permanent impairment, and includes presbycusis, which is a HI resulting from the aging process. A HI can also be of 'mixed' nature, where both conductive and sensorineural components are evident.

Magnitude refers to the severity of the HI. While there are different classification systems in use around the world, the terms normal, slight, mild, moderate, moderately-severe, severe and profound are commonly used to describe hearing status (Clark, 1981).

Configuration refers to the shape of the audiogram. A HI is described as 'flat' if there is little variation in threshold levels across the frequencies, whereas a 'sloping' HI would imply poorer hearing in the high frequencies. If the audiogram showed poorer hearing in the low frequencies with better hearing in the high frequencies, the HI would be described as 'rising'.

As the combination of magnitude and configuration can make it difficult to compare HI across individuals, the Pure Tone Average (PTA) can be used to describe overall loss. The PTA is calculated using either three or four frequency thresholds, typically between 500 and 4000 Hz.

1.2.2 Prevalence

As noted earlier, the World Health Organization (2006) estimates that 364 million people worldwide have a mild HI, with a further 278 million people experiencing a disabling HI. Defining HI as being a four-frequency PTA of 25 dB HL or greater, Agrawal, Platz, & Niparko (2008) found the prevalence of HI to be 16.1% within the US population aged 20 to 69 years. Further to this, they found that men were more likely to exhibit a HI, with the prevalence for both genders increasing with age. Nachtegaal and colleagues (2009) reported that the majority of HIs are seen in the population aged over 70, thus the 16.1% estimate is likely to be an underestimate of the true population prevalence.

Using the same criteria as Agrawal et al. (2006), Wilson and colleagues (1999) observed the prevalence of HI to be 16.6% in a South Australian population aged 15 years and older. Based on self-report data collected in three NZ census surveys between 1991 and 2002, the estimated prevalence of HI in the New Zealand population is between 5.7% and 10.3% (Greville, 2005). Under-reporting may be evident here due to various factors such as exclusion of those living in care-facilities, use of the word ‘disability’, and use of a self-report measure resulting in lower prevalence estimates. Given the ageing population of the western world, it is likely that the incidence of HI will increase in the coming years.

1.2.3 Impact of hearing impairment

The following section relates to literature investigating the numerous effects that HI has on a person. Multiple factors, such as degree of loss, level of activity and personality, can affect the degree to which HI impacts on an individual’s life (Sataloff, Sataloff, Virag, Sokolow, & Luckhurst, 2006), and the World Health Organization’s (2001) model of International Classification of Functioning, Disability and Health clearly shows the interactions between these factors.

1.2.3.1 The impact of health conditions

In 2001, the World Health Organization released The International Classification of Functioning, Disability and Health (ICF). The ICF allows for the description of health and health-related states by providing both a framework and a standardized common language. It is intended not to classify people, but to describe the situation of each individual relating to health or health-related domains. There are two main parts to the ICF with two components within each part (World Health Organization, 2001):

(1) Functioning and Disability

- a. Body Functions and Structures
- b. Activities and Participation

(2) Contextual Factors

- c. Environmental Factors
- d. Personal Factors

Both positive and negative terms can be used to describe the components (World Health Organization, 2001). The components of Functioning and Disability can describe both non-problematic aspects of health relating to functioning, and problems such as activity limitations or participation restrictions relating to a disability. The ICF defines ‘Body Functions’ as the physiological functions of body systems, including psychological functions, while ‘Body Structures’ are the anatomical parts of the body. ‘Impairments’ describe a significant deviation or loss in body function or structure. ‘Activity’ describes the execution of a task or an action by individuals, whereas participation is involvement in life situations. It follows that ‘Activity Limitations’ are difficulties experienced by individuals when executing activities, while ‘Participation Restrictions’ are difficulties experienced in life situations (World Health Organization, 2001).

Within Contextual Factors, ‘Environmental Factors’ involves the physical, social and attitudinal environment in which the individuals live. ‘Personal Factors’ relate to the the background of the individuals in terms of their life and living, including factors that are not part of a health condition, such as age, gender, fitness, and education. While these factors are not directly related to the health condition, they may play a role in the disability experienced by an individual (World Health Organization, 2001). Figure 1 shows how these components interact with each other.

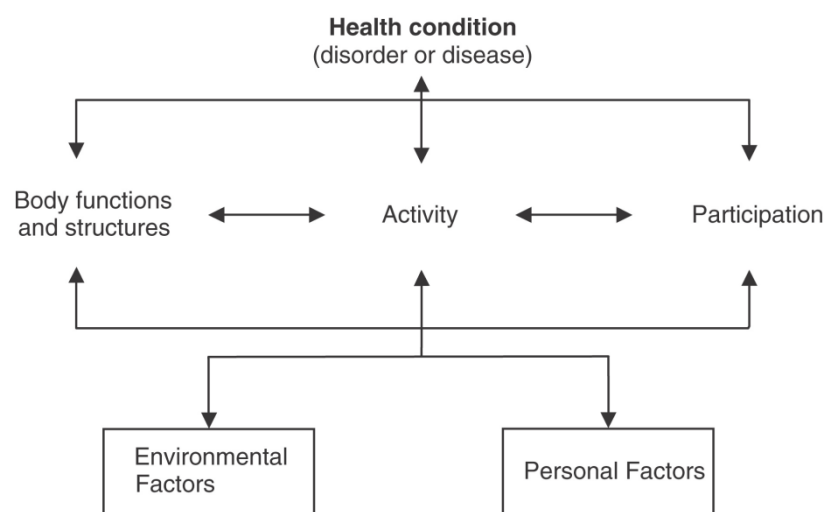


Figure 1. Model showing the interaction between ICF components (World Health Organization, 2001)

The ICF model illustrates how health conditions can impact upon people’s daily living, particularly their daily activities and participation within society. Previous research suggests that activity limitations and participation restrictions are related to decreased well-being (Helvik et al., 2006a; Hickson et al., 2008) and quality of life (QoL; Hickson et al., 2008).

1.2.3.2 Measurement of the impact of hearing impairment

As Gatehouse (2001) aptly stated, “the experience of disability and handicap can only be understood and assessed via reports from impaired individuals and those with whom they interact” (p. 91). While pure tone audiometry is able to describe the level of HI, it is unable to provide information relating to how individuals experience their HI in everyday life. Thus, it is the responsibility of the clinician to obtain the information by asking appropriate questions, and the client to provide the relevant information, in order to identify the areas where difficulties are experienced due to the impairment and what interventions may be suitable. Measures are available for both general, health-related quality of life and also disease-specific quality of life, with HI being the disease in this case.

Ventry & Weinstein (1982) proposed that hearing handicap related not only to the HI itself, but to personal factors also such as personality, psychosocial adjustment and physical health. Thus, in order to assess hearing handicap, an audiologist requires more than just audiometric data. The Hearing Handicap Inventory for the Elderly (HHIE: Ventry and Weinstein, 1982) was developed in order to assess social and emotional adjustment of the elderly to a HI. Also available is the Hearing Handicap Inventory for Adults (HHIA: Newman, Weinstein, Jacobson, & Hug, 1990) which is a modified version of the HHIE for use with individuals under the age of 65. Completion of the Hearing Handicap Inventory (HHI) either for the elderly or adults at the initial audiological assessment provides information to the audiologist regarding specific emotional and situational difficulties the individual may be having, thus allowing the audiologist to recommend effective management options, such as counselling or amplification. It is short to administer and easy to score making it suitable for use in clinic. It was suggested that the measure be used pre- and post-intervention to determine a change in self-perceived hearing handicap, and test-retest analyses deemed this to be possible (Newman et al., 1990; Weinstein, Spitzer, & Ventry,

1986). Thus, the HHI can be used with people of all ages with HI to determine the change to the individual's self-perceived handicap.

Many researchers have investigated the relationship between measured HI and self-perceived hearing handicap with a variety of results reported. Significant relationships have been found between degree of HI and hearing handicap as measured by the screening version of the HHIE (HHIE-S: Chang et al., 2009; Chew & Yeak, 2010; Dalton et al., 2003), and also between degree of HI and self-reported communication difficulties (Dalton et al., 2003). Both Chew and Yeak (2010) and Chang et al. (2009) concluded that although two individuals may have the same level of HI, each person may experience the HI differently, indicating that due to the involvement of other factors, such as those given in the ICF model, it is not a one-to-one relationship. In earlier work, Swan and Gatehouse (1990) proposed that the disability and handicap experienced by an individual does not necessarily correspond to the individual's measured HI; therefore, as the goal of rehabilitation is to reduce disability, it is important to obtain reports of disability experienced before and after hearing aid fitting.

After reviewing the literature, Demorest, Wark, and Erdman (2011) stated that while the difficulties experienced by an individual are related to audiometric results, the audiogram itself cannot predict the extent of the communication and adjustment difficulties experienced. Furthermore, the differences in the difficulties experienced by individuals with a given HI suggests that there are other variables affecting the way in which the HI is experienced, and thus subjective report of the individual's hearing problems is necessary to assess the need for rehabilitation (Demorest et al., 2011). It is understandable that people may experience a HI in different ways due to their environment and those that surround them. Thus, it is important for the audiologist to obtain this extra information when assessing what rehabilitation options to recommend. It has been suggested that the people identified by their significant level of

hearing handicap may be the ones who will benefit from hearing aids or other audiological intervention (Chang et al., 2009; Chew & Yeak, 2010).

1.2.3.3 Quality of life and hearing impairment

Quality of life is a broad concept with various definitions provided in the literature (Hallberg et al., 2008). One way to view QoL is an individual's psychological general well-being (Hallberg et al., 2008). In effect, QoL and well-being, and also 'general satisfaction', can be regarded as the same concept (Helvik, Jacobsen, & Hallberg, 2006b), and thus literature relating to both will be discussed in this section. Literature relating to the change in QoL following rehabilitation will be discussed in a later section.

It is well established that HI can affect health-related quality of life (HR-QoL), particularly psychological, social and emotional functioning (Nachtegaal et al., 2009). Several self-report inventories have been validated in order to assess HR-QoL, including the MOS 36-item Short Form health survey (SF-36: Ware & Sherbourne, 1992), the Psychological General Well-Being scale (PGWB: Dupuy, 1984), and the Ryff Psychological Well-Being Scale: Condensed (the Ryff Scale: Ryff, 1989), while the HHI can be used to assess disease-specific QoL. Results of studies have varied when investigating the effects of HI on QoL. Some have shown that reduced QoL and well-being are related to degree of HI (Dalton et al., 2003; Hickson et al., 2008), hearing handicap (Dalton et al., 2003), self-reported communication difficulties (Dalton et al., 2003; Hallberg et al., 2008), sense of humour (Helvik et al., 2006a) and use of maladaptive behaviours, such as bluffing and withdrawal from social situations (Hallberg et al., 2008; Helvik et al., 2006a). Helvik and colleagues (2006b) found a significant, inverse relationship between degree of HI and perception of general health.

On the other hand, studies have failed to find a significant association between QoL and degree of HI (Hallberg et al., 2008; Helvik et al., 2006a; Hickson et al., 2008), subjective report of HI, and duration of HI (Helvik et al., 2006a). Also, Helvik et al. (2006b) found that associations between degree of HI and perceived anxiety and life situation were not significant. Note that the assessment tools used may influence whether a relationship is found between two variables. For example, in Hickson et al. (2008) a significant result was found when using the Ryff Scale, but not when using the SF-36.

Interestingly, Tambs (2004) found that effects of HI decreased as age increased, even though HI increases with age, and that this effect was evident only for low-frequency HI. Tambs (2004) stated that the decline of effects on self-esteem with age makes sense, as in the later years a HI is common and is therefore seen as normal. HI in the young, however, is seen as unusual, and individuals may see themselves as different and less able to function as normal when compared to their peers. This effect was also evident for anxiety, depression and well-being, although the trends were not as strong. Tambs (2004) also found these effects to be stronger in men, and speculates that career expectations may be the reason behind this. It was also found that in young people, the effects of a change from normal hearing to a mild HI on mental health were more severe than the effects of a change from a severe loss to a profound HI. Similar effects were also found in middle-aged people. Tambs (2004) suggested these results are due to the potential for a mild HI to progress over time, whereas a severe HI is often steady and the individual is likely to have adapted to this impairment.

Sataloff and colleagues (2006) stated that home life can be affected by a HI, as difficulties in communication arise, possibly leading to tension among family members and marital strain between partners. Kelly and Atcherson (2011) found that communication difficulties in the home were experienced by all 40 of the participants in their recent study,

and that this negatively affected their QoL. The majority of participants also found QoL was reduced by their difficulty in communicating with friends, and almost 75% reported an effect on enjoyment of social events. Almost half of the participants expressed difficulties enjoying television with their significant other to the extent that television was viewed in separate rooms.

In regard to situations outside of the home, Sataloff et al. (2006) stated that economic aspects can be affected by a HI, either directly through job performance, or indirectly through a decrease in social contact in the workplace. Jennings and Shaw (2008) presented three short case studies which demonstrated the negative effects of HI, in particular the stress caused by difficulties in communicating at work and in social situations. A strained relationship between listener and speaker can result in withdrawal from these situations (Sataloff et al., 2006). Hickson et al. (2008) reported that participants found difficulties with communicating in noisy environments, and when in a group of people. Many reported feeling a lack of understanding relating to the HI from other people.

Studies have also shown a relationship between HI and impaired activities of daily living (ADL; Dalton et al., 2003; Gopinath et al., 2012), and measures of activity limitations and participation restrictions (Helvik, Jacobsen, Wennberg, et al., 2006; Hickson et al., 2008). Interestingly, Gopinath and colleagues (2012) reported the associations for those aged below 75 years only, suggesting that the more important causes of impaired ADL in the later years are not related to HI. Helvik, Jacobsen, Wennberg, and colleagues (2006) found both better-ear PTA and perceived severity of HI predicted activity limitation and participation restriction, while Gopinath et al. (2012) reported no significant association between HHIE scores and impaired ADL. As mentioned earlier, research has found that activity limitation and participation restriction are related to decreased QoL. Helvik, Jacobsen, and Hallberg

(2006a) found a negative correlation between the PGWB and both activity limitation and participation restriction. In support of this, Hickson and colleagues (2008) reported correlations between measures of QoL and well-being and measures of activity limitation and participation restriction, indicating that increased activity limitation and participation restriction are associated with reduced QoL and lower well-being.

As suggested earlier, the variety in results of the above studies may be explained by the differences in measures used. In terms of HI, Dalton et al. (2003) used a bilateral four-frequency pure tone average, while others employed a better-ear PTA (Helvik et al., 2006a, 2006b; Hickson et al., 2008), and Hallberg et al. (2008) utilized two HI variables: PTA-low and PTA-high. QoL and well-being were measured using the SF-36 (Dalton et al., 2003; Hickson et al., 2008), the Ryff Scale (Hickson et al., 2008) and the PGWB (Hallberg et al., 2008; Helvik et al., 2006a). It is difficult to compare results when the methodology of the studies are not the same. Also, population differences may produce conflicting results.

1.2.4 Adjustment to hearing impairment

Erdman and Demorest (1998a) stated that adjustment to HI involves cognitive and behavioural changes made individuals in response to difficulties caused by their HI. Individuals with the same audiometric results can vary widely in terms of the degrees of communication and adjustment difficulties, and these issues can change as their environment changes (Erdman & Demorest, 1998b). Thus, it is not just the level of HI which affects the adjustment to a HI; rather, psychosocial factors also play a large part in the adjustment process.

Hallberg (1999) stated that coping is largely involved in the adaptation to a HI. Positive, or adaptive, coping strategies are able to reduce stress in communication situations,

whereas maladaptive strategies may result in greater feelings of handicap (Hallberg, 1999). When adjusting to a HI, both general coping styles and the personality of the individual, and also the psychosocial environment, are likely to be involved. In depth interviews with hearing impaired participants, revealed two coping patterns: 1) to control the social scene, and 2) to avoid the social scene (Hallberg, 1999). The controlling strategies included management of the situation, informing others about their HI, and generally taking responsibility to ensure they hear what is said. Avoiding strategies on the other hand, included avoidance of difficult listening situations, isolation from other people, and minimizing the disability.

Gomez and Madey (2001) found that use of both adaptive and maladaptive strategies was more likely if the individual perceived that strategy as being useful, regardless of whether it aided communication. So although maladaptive strategies may not enhance communication, individuals with HI may see them as a way to help them cope with their impairment. Their results showed use of maladaptive strategies was positively related to perceived absence of support, and negatively related to personal adjustment.

Andersson and Hagnebo (2003) reported participants with HI used strategies involving problem-solving and self-control, and strategies involving escape or avoidance were less commonly employed. They also found anxiety sensitivity, a construct which describes “individual differences in fear of anxiety” (p. 36), was associated with these maladaptive strategies. However, the individuals involved in this study were members of a hard-of-hearing association, and 78% were hearing aid users. As a large proportion of their participant pool had adopted hearing aids it is likely that they had accepted and adjusted to their HI and engaged adaptive strategies as the results suggest. A large part of the process of adjustment to HI is acceptance of the HI (Hallberg, 1999). If the individual has accepted the impairment then the HI has likely been integrated into the individual’s self-concept.

Integration of the HI into the individual's self-concept indicates the acceptance of the HI and facilitates psychological adjustment to the HI. Once this has occurred, the individual no longer hides the disability and takes an active approach in making sure they hear when they need to.

In order to help older adults cope with their hearing difficulties, the audiologist may need to address psychosocial issues after completion of the audiological assessment (Gomez & Madey, 2001). Hallberg et al. (2008) concluded that coping ability needs to be assessed and also suggested the implementation of training programmes designed to assist individuals with coping with their HI. They also recommend that communication partners be involved in the process of adjustment, providing improved well-being by learning communication techniques to use with the hearing impaired individual.

1.2.5 Effect of hearing aid adoption on the impact of hearing impairment

Hearing aids and rehabilitation strategies are often sought in order to address the issues faced by a person with HI. However, reports suggest many individuals live with their problems without seeking help for or confirmation of their HI, while many of those who are recommended hearing aids choose not to try them. Davis, Smith, Ferguson, Stephens, and Gianopoulos (2007) stated that individuals who are referred for audiological assessment often report that they have had a HI for about 10 years, and Kochkin (2009) reported that hearing aid users wait an average of seven years before adopting hearing aids, while non-adopters had been aware of their hearing problems for around 12 years. Kochkin (2012) reported nearly one in four people with HI own hearing aids, similar to results published more than 20 years earlier (Gates, Cooper, Kannel, & Miller, 1990). Researchers have tried to determine for what reasons people seek help from hearing professionals for their HI, what factors likely influence their decision to adopt hearing aids, and the benefits gained from hearing aid uptake.

1.2.5.1 Factors influencing help-seeking

Comparing individuals consulting for audiological services to non-consulters, Swan and Gatehouse (1990) found consulters had significantly poorer worse-ear hearing, and poorer speech discrimination scores for both ears. Although self-reported disability for the better ear was not significantly different, consulters rated their worse-ear hearing as poorer than that of the non-consulters.

In a more recent study, Duijvestijn et al. (2003) reported that of those who had consulted their GP regarding their HI, 84% rated their hearing as ‘poor’ in comparison to 57% of the non-consulters. A significant difference was also found between the two groups in terms of the social pressure to seek help they experienced. There was no significant difference between the two groups in terms of hearing aid image, but as expected, those in the consulter group were more willing to try a hearing aid. Those who report poor hearing along with being bothered by their hearing on a day-to-day basis are seven times more likely to consult a GP. The researchers concluded that it is not just HI that influences the decision to seek services relating to a HI, but other factors such as social pressure, and willingness to try a hearing aid.

1.2.5.2 Factors influencing hearing aid adoption

Several studies have identified a relationship between self-perceived hearing handicap and hearing aid uptake (Garstecki & Erler, 1998; Gopinath et al., 2011; Helvik, Jacobsen, Wennberg, et al., 2006; Hogan et al., 2001; Humes, Wilson, & Humes, 2003). Chang et al. (2009) reported a higher rate of use of, or need for, hearing aids in those with a self-perceived handicap when compared to those with low scores on the HHIE. The link between HHIE score and hearing aid adoption was also reported by Fischer et al. (2011) who also found that a poor self-rating of quality of hearing was significantly related with hearing aid adoption.

The researchers also reported that hearing aid adoption was also significantly associated with college education and family history of HI.

Other factors implicated in hearing aid adoption include measureable HI (Fischer et al., 2011; Gopinath et al., 2011), bilateral HI (Kochkin, 2007), greater difficulty in one-to-one conversations and group situations (Hogan et al., 2001), decreased ability to understand speech-in-noise (Robertson, Kelly-Campbell, & Wark, 2012), greater awareness of a HI (Gopinath et al., 2011; Kochkin, 2007; Palmer, Solodar, Hurley, Byrne, & Williams, 2009), increased activity limitation and participation restriction (Helvik, Jacobsen, Wennberg, et al., 2006), older age (Gopinath et al., 2011), less social support (Cox, Alexander, & Gray, 2005) and experience of difficulties due to their HI more than 50% of the time in a normal day (Kochkin, 2007). Many of these findings suggest that people who are more aware of a HI and experience more difficulty as a result are the ones who will adopt hearing aids. By establishing the opinion of the person regarding the hearing impairment at the beginning of an audiological evaluation, an audiologist can gauge the readiness of the client for hearing aids, or whether other assistance or counselling may be a better option at that point in time.

Other points to consider were raised by Garstecki and Erler (1998) who investigated differences between hearing aid adopters and non-adopters in terms of gender. They found male non-adopters were more concerned with public reaction to hearing aids and showed increased difficulty in admitting their HI to others when compared to the male adopters. Female adopters placed more importance on communication, used more nonverbal strategies, and experienced more anger and impatience relating to their HI. Adopters in both gender groups were less concerned regarding expense than the non-adopters. These findings suggest that adopters are more accepting of their HI, admitting to others that they have a problem, being unconcerned with public reaction and with the expense associated with a hearing aid.

Alongside the multitude of reasons implicated in hearing aid adoption are many reasons for choosing not to try a hearing aid after recommendation from a hearing professional. Studies have reported that individuals may believe their HI does not yet warrant a hearing aid (Gopinath et al., 2011; Kochkin, 2007; Öberg, Lunner, & Andersson, 2007), and that hearing aids are too expensive (Fischer et al., 2011; Gopinath et al., 2011; Kochkin, 2007) and are inconvenient (Fischer et al., 2011). They may report hearing negative experiences reported by others (Gopinath et al., 2011; Fischer et al., 2011), or have negative beliefs regarding aspects of the hearing aids themselves (Kochkin, 2007), a lack of knowledge regarding where to get help for their HI (Kochkin, 2007), or be deterred by the stigma associated with hearing aid use (Kochkin, 2007). It has also been found that individuals who choose not to adopt hearing aids are more likely to use maladaptive behaviours (Helvik, Wennberg, Jacobsen, & Hallberg, 2008). Recall that increased use of maladaptive behaviours is related to reduced QoL (Hallberg et al., 2008; Helvik et al., 2008).

Helvik et al. (2008) also reported that greater activity limitation and participation restriction decreased the likelihood in which an individual would reject a hearing aid. A recent study by Robertson and colleagues (2012) supports this idea, with three groups of hearing impaired individuals investigated: those who purchased and kept hearing aids, those who rejected hearing aids after purchasing, and those who chose not to try hearing aids. Of the variables examined, the one factor that significantly differentiated the groups was speech-in-noise: Those who purchased and kept their hearing aids exhibited greater difficulty in this measure, indicating that they are likely to experience greater difficulty in noisy social situations, and thus, greater activity limitation.

Cienkowski & Pimentel (2001) conducted a survey of normal hearing college students, older hearing impaired adults who had adopted hearing aids and older hearing

impaired adults who had not adopted hearing aids. The results revealed that over half of the college students would be concerned to be seen wearing a hearing aid, while more than one third would feel embarrassment, even though it appeared they did not believe that attention would be drawn to the wearer of a hearing aid. The non-adopters were also more likely to associate hearing aids with aging, perhaps one reason as to why they had not yet adopted hearing aids (Cienkowski & Pimentel, 2001). Interestingly, the college students and the hearing impaired older adults who had no experience using hearing aids believed that hearing aids are easy to adjust and beneficial.

Gussekloo et al. (2003) reported findings similar to some of those mentioned above, however other findings are in contrast to the research. Participants aged 85 years with untreated severe HI were invited to participate in an auditory rehabilitation programme; 23% accepted, while 77% declined. In depth interviews with 13 women, five who accepted and eight who declined, revealed the use of successful coping strategies in their day-to-day lives. Those who accepted regarded their hearing difficulties as more serious and envisaged the use of hearing aids to be useful in more situations than those who declined. Several of those who declined did not consider their hearing to be a priority over other areas of their lives. Negative aspects reported about hearing aids by people they knew also affected participation in the programme, yet stigma and finances were not issues pertinent to hearing aid adoption. Social isolation due to their HI was regarded as the most important reason for adopting a hearing aid, especially in terms of family involvement.

In line with this finding, Espmark and Scherman (2003) stated that hearing impaired individuals will not adopt hearing aids until their HI is experienced as a lack of contact with life. If individuals are able to use strategies, feel their HI is not bad enough to warrant a hearing aid, or are perhaps in denial, they are unlikely to adopt a hearing aid, even if it is

recommended by an audiologist. Kochkin (2007) believes there are four events which must occur in order for individuals to seek a solution for their HI: 1) recognition of the HI, 2) recognition that the HI causes them difficulties, 3) belief that the solution (for example, hearing aids) will decrease the difficulties experienced, and 4) recognition that individuals may have many factors hindering their progress towards a solution. These events relate to the idea of acceptance of a HI. Once individuals have accepted they have an impairment, and realise that assistance is required, they can then focus on the rehabilitation itself, allowing them to participate in social situations and enhancing communication exchanges.

1.2.5.3 Benefit of hearing aid adoption

One of the main benefits seen with adoption of hearing aids is that of improved QoL. Surveys have shown over half of those who use hearing aids report better QoL since adoption (Kochkin, 2011; Öberg et al., 2012). Using the HHIE, significant changes have also been noted with improvement still evident three months after adoption (Lotfi, Mehrkian, Moossavi, & Faghih-Zadeh, 2009), 12 months after adoption (Mulrow, Tuley, & Aguilar, 1992), and the number of participants who felt handicapped by their HI significantly decreased six months after fitting (Vuorialho, Karinen, & Sorri, 2006). Stark and Hickson (2004) also found a significant decrease in the HHIE score post-fitting with greater changes found in those with greater HI and for those who wore their hearing aids for more than four hours per day (Stark & Hickson, 2004). A systematic review of the literature determined that disease-specific HR-QoL measures, such as the HHIE, showed a positive benefit of the use of hearing aids, with improvements in social, emotional, and psychological well-being (Chisolm et al., 2007). Use of generic HR-QoL measures, on the other hand, demonstrated fewer significant results, supporting the view that these measures are not sensitive in assessing the outcome of hearing aid intervention (Bess, 2000).

Reporting on the MarkeTrak survey, Kochkin (2011) noted over half of participants reported hearing aids improved their ability to communicate effectively in most situations, and improved relationships at home, their social life, and ability to join in groups. Just under half reported improved feelings of safety, self-confidence, sense of independence, and work relationships, while more than 25% reported better sense of humour, mental and emotional health, romance, cognitive skills, and physical health. Similar results were found in the National Council on Aging survey, with hearing aid users more likely to participate in activities involving other people, expressing greater interpersonal warmth in their relationships, observing a reduction in negativity in family relationships, and reporting lower use of compensatory strategies (Seniors Research Group, 1999). Hearing aid users also reported lower self-ratings of negative emotions or traits such as instability, lower tendencies to exhibit anger and frustration, and fewer depressive symptoms. Finally, hearing aid users are more likely to report better health (Kochkin & Rogin, 2000; Öberg et al., 2012).

It is not only hearing aids that have shown success with hearing impaired individuals; Hickson, Worrall, & Scarinci (2007) demonstrated this with a group programme, Active Communication Education (ACE), aimed at older adults with HI. Following participation in the ACE programme, participants saw significant reductions in participation restriction and activity limitation, along with improvements in well-being. However, these results were not significantly different from a control group who were attending a social programme. There was also no significant difference in HR-QoL pre- and post- attendance at the ACE programme. This study suggests that general group work with HI individuals may be a key in helping these people improve communication strategies in order for them to be more active in their environment. Programmes such as these may also be of benefit to those who exhibit HI but are not yet ready to try hearing aids.

Thus, it can be seen that hearing aids and other rehabilitation programmes have a positive impact on people with HI and self-perceived handicap. It follows that untreated HI may mean an individual has reduced QoL, increased negative emotional reactions to the HI, and reduced social participation. As well as this, research has suggested that sensory impairments are significantly associated with cognitive function in older age (Baltes & Lindenberger, 1997; Lindenberger & Baltes, 1994, 1997) and that use of hearing aids can protect against these negative effects (Cacciatore et al., 1999).

1.3 Anxiety and Hearing Impairment

Briefly mentioned above was the fact that individuals with HI may experience anxiety because of their difficulties. Stephens and Héту (1991) proposed that one of the disadvantages relating to the reduced QoL experienced by a hearing impaired person is anxiety. They give the example of a person not being able to hear warning signals or approaching vehicles in noisy traffic areas. Due to a fear of not being able to orient themselves correctly in this situation, individuals may experience anxiety (Stephens & Héту, 1991).

Studies investigating the link between anxiety and HI have produced mixed results. Mehta and colleagues (2003) found that those with HI were more likely to show anxiety symptoms. Kent and La Grow (2007) found a significant positive correlation between anxiety and degree of HI, whereas Helvik, Jacobsen, and Hallberg (2006b) reported a trend that did not reach significance, and Nachtegaal et al. (2009) did not report an association between the two in general. However, after breaking the study sample into age groups a significant association was found between anxiety and level of HI for those aged 40 to 49 years, with no significant results for any other age group between 18 and 70 years (Nachtegaal et al., 2009). Tambs (2004) found a significant main effect for anxiety and low frequency HI only, and also noted that self-reported HI explained self-reported mental health better than audiometric

results. This latter finding is in agreement with those of other studies, finding that anxiety was significantly related to perception of hearing handicap, but not audiometric results (Andersson & Green, 1995; Eriksson-Mangold & Carlsson, 1991; Öberg et al., 2007). These latter findings suggest that how people perceive their hearing affects how they perceive their mental health status more so than the actual degree of impairment, and that when investigating anxiety in the hearing impaired population, a better measure is self-report hearing handicap rather than measured HI. It has been suggested that anxious people may be more likely to experience or report hearing difficulties (Jones, Victor, & Vetter, 1984; Saunders & Cienkowski, 1996), yet the reasons may be more complicated than this considering the greater social and emotional impact experienced by the more anxious individuals (Saunders & Cienkowski, 1996).

Other interesting results have appeared in the literature linking HI and anxiety. Eriksson-Mangold and Carlsson (1991) also found a significant relationship between speech discrimination and scores of anxiety, suggesting that anxiety is experienced more by those who have trouble with speech perception. Öberg et al. (2007) found negative correlations between anxiety and both increased use of maladaptive communication strategies, and greater activity limitation and participation restriction, which as mentioned earlier, are related to reduced QoL. Kent and La Grow (2007) found a negative correlation between anxiety and acceptance, possibly indicating that those who have accepted their HI are less likely to experience anxiety. Conversely, it could be that those who are less anxious are more likely to be accepting of their HI. Hallberg (1999) stated that acceptance of the HI facilitates psychological adjustment to the HI, whereby individuals proceed to take an active approach in their hearing. In comparing those who had adopted hearing aids and those who had not, Kochkin and Rogin (2000) found non-adopters were more likely to experience a greater

number of anxiety symptoms and also exhibit more social phobias than hearing aid adopters. This result was only significant for certain degree-of-HI groups, however.

1.3.1 Relationship between anxiety, hearing impairment and age

Research into age and anxiety disorders or symptoms using a variety of measures have indicated that the older population experience less anxiety than the younger population. Brenes (2006) investigated the differences between younger and older adults in three components of anxiety: affective (emotional feelings), cognitive (associated thoughts and worries), and somatic (associated physiological sensations) symptoms. She found that younger adults experienced more worry than older adults, although affective and somatic symptoms of anxiety did not differ. The results of a large epidemiologic study conducted in the US reported a decrease in both twelve-month and lifetime prevalence for any anxiety disorder as age increased with the lowest prevalences found in the group aged 75 years and older (Gum, King-Kallimanis, & Kohn, 2009). A slight difference was found by Jorm (2000) who identified a common trend in previous studies where the prevalence of anxiety would increase across the age groups, and then show a decrease in the group aged 65 and over. This is consistent with Wells and colleagues (2006) who found that the prevalence for Generalised Anxiety Disorder (GAD) was highest in the age group of 25-44, but lowest in the group 65 and over. A review by Lenze and Loeback Wetherell (2011) indicated that while prevalence of specific phobias, post-traumatic stress disorder, and panic disorder falls between adulthood and old age, prevalence of worry and fear of falling increases. Although minor differences in results have appeared in the literature, there is strong evidence that anxiety is experienced less often in the elderly population of 65 years and over. Meanwhile, Fuentes and Cox (2000) found no difference in the prevalence of anxiety symptoms between younger and older adults.

In terms of the hearing impaired population, research investigating relationships between the three variables of HI, anxiety and age are scarce. Tambs (2004) found that the effects of low-frequency hearing loss on anxiety decreased significantly with age, and suggested that this may be because older people view HI as a normal part of aging. Young people, however, view HI as something that makes them different from their peers. Tambs (2004) also found that younger people experienced greater effects to their mental health when their hearing deteriorated from normal to a mild HI rather than from a severe to profound HI. He speculated that a mild HI is thought to get worse over time, whereas a more severe loss is likely to remain stable, and acceptance of this loss is likely to have occurred. As mentioned earlier, Nachtegaal et al. (2009) found a significant association between anxiety and level of HI for those aged 40 to 49 years only. No significant results were reported for any other age group between 18 and 70 years, in contrast to the finding that young people experience more anxiety.

Researchers have proposed several reasons as to why the rate of anxiety appears to be significantly lower in older age groups than in younger age groups. Gum and colleagues (2009) have suggested that older adults have better coping skills; are part of a cohort that is more resilient than younger cohorts; have not had the same pressure applied to them as the younger cohort from the modern world; and are less willing than younger groups to report mental health problems due to the stigma associated with them. The differences between the age groups can also depend on the method employed in a particular study. While one method may include aspects of anxiety that are generally found in older people, another may focus on symptoms experienced by younger people, thus biasing the results (Gum et al., 2009; Jorm, 2000). An important point that Gum and colleagues (2009) noted is that sampling bias may be present due to the possibility that people with significant psychiatric problems die earlier, experience co-morbid illnesses, or are in care-facilities, meaning they are unable to

participate in research studies. It has also been suggested that anxiety measures designed with the younger population in mind are not suitable for older persons (Flint, 2005; Fuentes & Cox, 1997; Palmer, Jeste, & Sheikh, 1997), however Fuentes and Cox (2000) determined that anxiety experienced by the different age groups was similar, and thus it was generally acceptable to use the same measures for both younger and older groups.

1.3.2 Relationship between anxiety, hearing impairment and gender

Evidence for women experiencing more anxiety than men has been well documented over the years. Several recent studies with adults have added to this research, finding that women are more likely to experience an anxiety disorder in their lifetime (McLean, Asnaani, Litz, & Hofmann, 2011), have higher 12-month prevalences for most anxiety disorders (McLean et al., 2011; Wells et al., 2006), and produce higher scores on tests of anxiety (Brenes, 2006). Fuentes and Cox (2000) compared anxiety scores on a number of measures between younger and older adults. They found that within the younger age group there was no difference between the genders, however women in the older group tended to score higher in anxiety measures than older men. Older women have also been found to be more destabilized and chronically anxious (De Beurs, Beekman, Deeg, van Dyck, & van Tilburg, 2000) and are more likely to have anxiety symptoms than older men (De Beurs et al., 2000; Mehta et al., 2003). Beekman and colleagues (1998) found that the 6-month prevalence rate of anxiety disorders for older women was almost twice that of older men.

Several studies have failed to find gender differences in terms of anxiety in the hearing impaired population (Andersson & Green, 1995; Hallberg et al., 2008; Nachtegaal et al., 2009). Nonetheless, Helvik et al. (2006a) found that men reported feeling less anxious than women, in line with Garstecki and Erler (1999) who noted women were more likely to

report feeling anxious because of their HI. These findings support the view that women experience more anxiety than men.

Limitations to the research such as use of retrospective assessment (McLean et al., 2011), self-report measures resulting in reporting bias (Bekker & van Mens-Verhulst, 2007; McLean et al., 2011), and different diagnostic tools resulting in different prevalence rates (Bekker & van Mens-Verhulst, 2007) have been proposed as reasons why a gender difference is found when investigating anxiety in adults. Biological, behavioural, and environmental factors have also been proposed as some of the many influences that lead women to experience anxiety more often than men (McLean & Anderson, 2009). One view is that gender roles play a large part in the identification of anxiety; it is generally more acceptable for women, who are seen to have lower levels of assertiveness and self-support, to admit to feelings of fear and anxiety, whereas men, who are seen to be more independent, are less willing to talk of such feelings (Bekker & van Mens-Verhulst, 2007; McLean & Anderson, 2009). This can create a bias in the data and affect the results of self-report measures, as mentioned above.

1.3.3 Relationship between anxiety, hearing impairment and quality of life

Quality of life and its relationship to anxiety has been commonly studied. However, many of the investigations looked at anxiety in patients with other health conditions or focussed only on one particular anxiety disorder such as panic disorder. Generally though, it appears there is indeed a relationship between anxiety and reduced QoL. Rapaport, Clary, Fayyad, and Endicott (2005) investigated QoL in a sample of patients with anxiety or affective disorders. Reduced QoL was found when compared to normative scores, and looking at anxiety disorders in particular, mild to moderate levels of impairment on the QoL measure were identified. Both Strine, Chapman, Kobau, and Balluz (2005) and Brenes (2007)

found a significant association between anxiety symptoms and reduced HR-QoL, with Brenes stating that as the symptoms of anxiety worsen, so too does the individual's QoL.

Again, research is scarce investigating the relationship between HI, anxiety and QoL. Because previous research has established a link between perceived HI and anxiety, and also between perceived HI and QoL, it could be hypothesised that a relationship exists between these three variables. If a relationship did exist, one of these variables may be acting as a moderator variable, affecting the relationship between the other two variables, or as a mediator variable, explaining the relationship. However, there may be no relationship at all between these three variables. In any case, a review by Mogotsi, Kaminer, and Stein (2000) noted a lack of consensus regarding the definition and measurement of QoL in anxiety studies, which makes it difficult to compare the results. Also, the authors comment that most of the studies completed have not investigated what came first: the anxiety disorder or the reduced QoL.

1.4 Cognitive Anxiety

The above literature on anxiety and HI investigated anxiety disorders and anxiety symptoms, usually assessed through self-report measures of trait anxiety. Another type of anxiety is that of *cognitive anxiety*; a transient, state anxiety which has recently been investigated in the hearing impaired population. State anxiety refers to a “transitory emotional condition that is characterized by subjective feelings of tension and apprehension and heightened autonomic nervous system activity” (Bucky, Spielberger, & Bale, 1972, p. 275). Trait anxiety, on the other hand, relates to “relatively stable individual differences in anxiety proneness, that is, a disposition to perceive a wide range of circumstances as personally threatening” (Bucky et al., 1972, p. 275). Thus, state anxiety is a temporary state of anxiety which can change over time, characterized by emotional feelings and bodily

activity in reaction to a specific stressful situation. Trait anxiety, however, refers to a personality trait, whereby the individual will perceive threat and as a result experience a state of anxiety.

1.4.1 George Kelly's Personal Construct Theory

Cognitive anxiety is based on George Kelly's (1955) Personal Construct Theory (PCT). Kelly viewed people as incipient scientists, endeavouring to develop 'constructs' about the events in their lives in order to understand and predict how these events will progress. It is not the event itself that holds importance, but the meaning assigned to that event by the individual. The meaning of an event is formulated by looking at both the cause and the consequence of the particular event. In assigning meaning to events, people seek to confirm the constructs which they have developed, but may find that the same event may confirm a different construct, or vice versa. When such a situation arises, reconstruction can occur, whereby the accuracy and significance of further anticipations can be improved by this new information.

Events are anticipated by a person through interpretation of their replications; a new event is compared and contrasted to an existing construct within the individual's construct system (Kelly, 1955). Through personal experience as a therapist, Kelly saw how people can apply different meanings to the same event (Butt & Burr, 2004), and thus proposed that it is unlikely that two people would develop the same construct system. Kelly (1955) stated that there is a finite number of dichotomous constructs within a person's construct system, and that each construct is useful in the anticipation of a limited range of events only. It is when an event falls mostly outside of this range that an individual may experience anxiety. Bannister (2003) provided an example involving students sitting an examination which helps to explain what is meant by an event falling *mostly* outside the range of convenience of a construct

system. He stated that while aspects of examinations, such as the layout of an exam and what is expected, fall within the range of convenience, other aspects do not. Questions arise whereby the students question how they will perceive themselves if they fail the examination, how others will perceive them, and what the long-term consequences of failing the examination be (Bannister, 2003).

This same logic can be applied to hearing impaired individuals communicating in a social situation. The individuals are familiar with communicating in this situation, thus this falls within the range of convenience of the construct system. The communication partner may be an old friend with whom many conversations have occurred in the past, also occurring within the construct system. However, with the onset of a HI, concerns arise, such as the individuals questioning how they will perceive themselves if they cannot understand the friend, and how the friend will perceive them. Kelly, Neimeyer, and Wark (2011) stated that because people with HI do not have full access to speech that is communicated to them, they may experience cognitive anxiety as they are unable to anticipate and meaningfully interpret the event. Kelly and colleagues (2011) further stated that the hearing impaired individual does not know when the communication breakdown will occur due to what is being missed in the conversation, thus resulting in a state of anxiety in such situations.

1.4.2 The Cognitive Anxiety Scale

Following from PCT and the idea that anxiety occurs when people encounter a situation which does not lie within their range of convenience, Viney and Westbrook (1976) proposed that cognitive anxiety occurs when an individual is unable, or only partially able, to interpret an event meaningfully and is therefore unable to judge the implications of the event. Five conditions were noted in which cognitive anxiety could arise. First, a completely new event is encountered that has not been experienced and thus does not lie within the construct

system. Second, an event requires extra constructs that are not available to the person. Next, conflict may occur in the construct system due to the occurrence of incongruous stimuli. Fourth, uncertainty may be produced by responses being unavailable to the person, and finally, interference with cognitive processes may occur such as when there is a high rate of stimulus presentation.

Viney and Westbrook (1976) developed the Cognitive Anxiety Scale (CAS) as a means to measure this cognitive anxiety. The CAS uses content analysis to find examples of cognitive anxiety in verbal samples. For the development, they followed the steps for developing a content analysis scale as recommended by Gottschalk and Gleser (1969). This involved clearly defining the psychological state under investigation, and then defining the unit of the content to be analysed; in this case the unit is the clause defined as a fragment of language that contains an active verb. Lexical cues must be determined whereby the listener can infer the speaker is experiencing the psychological state. Based on these cues, the intensity of the psychological state is specified, and then weights are applied. A correction factor is also applied to account for the number of words in the sample; dividing the total number of words in the sample into 100 gives the correction factor for the CAS. A score is subsequently derived, and distribution over a number of samples must be analysed in order to correct for any skewing evident in the data; Viney and Westbrook (1976) found the data to be positively skewed, thus square root transformations are applied to the score. Finally, normative data need to be established.

Viney and Westbrook (1976) established normative data by examining the results from five samples. In doing so, they found those who were experiencing novel and incongruous experiences had higher levels of cognitive anxiety than those whose environment was relatively stable. Evidence for this being a measure of state anxiety, rather

than trait anxiety was given in that scores were associated with measures of state anxiety, but not measures of trait anxiety, and cognitive anxiety levels were found to fluctuate over time. Several other studies have further shown the validity of the CAS as a measure of transient state anxiety (Bunn & Clarke, 1979; Viney, 1980). Finally, the authors noted that level of cognitive anxiety varied in terms of the individual's ability to successfully anticipate and integrate an experience.

The possible relationships between cognitive anxiety scores with several demographic variables were also investigated. For a sample of 200 new mothers, cognitive anxiety did not vary with age or level of education, however relationships were found with socioeconomic status and migration (Viney & Westbrook, 1976). Also assessed were the relationships between cognitive anxiety scores and other cognitive measures for new university students. Past academic performance, feelings of mastery, or a tendency to respond in a socially acceptable manner were not found to be related to cognitive anxiety (Viney & Westbrook, 1976).

Viney and Westbrook (1976) specified scoring guidelines, content categories and weights for the CAS. For this study, these will be based upon those used by Kelly and colleagues (2011). These were the original guidelines proposed by Viney and Westbrook but with refinements by DiLollo, Manning, and Neimeyer (2003) for the use in the field of communication disorders. The scoring guidelines, categories and weights will be detailed in the Method section.

1.4.3 Use of the Cognitive Anxiety Scale in the communication disorders

The CAS was first used in the communication disorders by DiLollo and colleagues (2003) with persons who stutter and those who are fluent speakers. While in the fluent

speaker role, significantly higher cognitive anxiety scores were evident in the persons who stutter group when compared to the fluent speaker group. On the other hand, significantly higher cognitive anxiety scores were seen in the fluent speaker participants when in the stutterer role compared to the persons who stutter group. Significant differences were also found when within group comparisons were made, with persons who stutter demonstrating higher cognitive anxiety scores in the fluent speaker role when compared to the stutterer role, while fluent speakers showed higher cognitive anxiety in the stutterer role when compared to the fluent speaker role. This suggests that increased levels of cognitive anxiety are present when the individuals are in non-dominant roles where they are unable to meaningfully integrate their experiences (DiLollo et al., 2003).

Kelly et al. (2011) employed the CAS for use with hearing impaired participants, investigating the role of cognitive anxiety in three groups of older adults: those who were not yet seeking services for their problem, those who were consulting for the first time, and those who had been fitted with a hearing aid. They found that the initial consultation group exhibited the highest cognitive anxiety scores, the non-consulting group had lower cognitive anxiety scores, and the hearing aid group exhibited the lowest cognitive anxiety scores. The results indicate that hearing impaired older adults experience greater levels of cognitive anxiety when consulting with hearing professionals for the first time. Interestingly, there were no significant differences between the groups in terms of demographic and audiometric variables. Some limitations were identified by the authors of this study. The first involved some participants being included in a larger study which may have affected the cognitive anxiety levels measured in the smaller study. Secondly, it was difficult to identify if gender was a factor in cognitive anxiety level, as the proportion of male participants was larger than that of female participants. This is reasonable given that men experience a greater decline in their hearing as they age (Pearson et al., 1995). Comparison of this study to other research is

difficult, as there have been no other studies employing the CAS with hearing impaired participants.

1.5 Rationale

This study seeks to resolve the issues evident in the Kelly et al. (2011) study by recruiting a wider age range of participants who are not involved in other research studies in order to investigate cognitive anxiety in people with HI and its relationship to client variables. To date, there has been little research investigating cognitive anxiety in this population, and none looking at specific client variables. Use of the CAS in this area is needed as few studies have focused on anxiety as a state, but rather have measured it as a trait. Many have also concentrated on the pathological view of anxiety, reporting on specific disorders and symptoms. In addition, the use of content analysis as opposed to self-report measures means that the individual does not need to be aware of feeling tense or nervous (Kelly et al., 2011). DiLollo and colleagues (2003) also point out that the main benefit of using the CAS is that participants are able to respond “in ways that are meaningful to them” (p. 171) rather than choosing a response provided to them by the researcher.

1.6 Aims and Hypotheses

The aim of the present study was to add to the small amount of research on individuals with HI and cognitive anxiety. Using Viney and Westbrook’s (1976) model of cognitive anxiety, this study sought to address the following research questions:

1. Is there a relationship between cognitive anxiety level and:
 - a. Age;
 - b. Gender;
 - c. Audiometric variables; and
 - d. Quality of life?

2. Is there a significant difference between the level of cognitive anxiety for the participants who purchased and kept hearing aids and those who did not?

General trends are evident in the research cited above, suggesting that these can be applied to the investigation of cognitive anxiety in people with HI. Specifically, it could be said that because older persons experience less anxiety and women experience more anxiety, it is likely that this will be true for cognitive anxiety and those with HI. Still, research utilizing the CAS has not demonstrated associations between cognitive anxiety score and demographic variables as yet (Viney & Westbrook, 1976). Previous results have been mixed in terms of anxiety and level of HI. Investigation of this relationship using the CAS may shed more light on this area, as it is state, rather than trait, anxiety that is being measured, and because people do not need to be aware of their anxiety as is required with self-report measures. Research has shown that people with HI and people who experience anxiety symptoms have reduced QoL, thus a decreased level of QoL is expected in the HI population, particularly those who experience higher levels of cognitive anxiety.

Based on the literature, the following hypotheses were proposed:

- 1a) CAS level is significantly and negatively correlated with age, with younger adults experiencing greater levels of cognitive anxiety;
- 1b) CAS levels are significantly higher for women than men;
- 1c) CAS levels are significantly correlated with audiometric variables, with better-ear pure tone average and speech in noise ratio loss positively correlated and word recognition score negatively correlated;
- 1d) CAS levels are significantly and positively correlated with self-perceived hearing problems (QoL); and
- 2) CAS levels are significantly higher for hearing aid adopters than non-adopters.

Chapter Two: Method

2.1 *A Priori* Power Analysis

Before commencing participant recruitment, required sample size was determined using *a priori* power analysis. Due to standard use in research, level of significance was set at .05 and statistical power at .80. An effect size of 1.0 was used based on the research of Kelly et al. (2011). The number of variables in the analysis was four and the type of statistical analysis was an ANOVA. Based on this information, 27 participants were required for this study.

2.2 Participants

Participants for this study were recruited from an audiology clinic in Phoenix, Arizona, USA. Consecutive clients meeting inclusion and exclusion criteria were invited to participate. Recruitment occurred over a 4-month interval.

Individuals were eligible to participate in this study if they met certain conditions. Firstly, because levels of cognitive anxiety may change through the consultation process (Kelly et al., 2011), it was important that participants had not been previously diagnosed with a HI in the past or trialled hearing aids.

As stated in the introduction, adjustment to hearing impairment (HI) may be influenced by age of onset and progression of the loss, thus there is the need to control for these factors when measuring cognitive anxiety. Participants needed to be aged 30 years or over and have a progressive or gradual HI.

Individuals with a profound HI were excluded from this study as it is likely these people would have experienced a rapid-onset HI, or have been in denial regarding their HI for some time. As a result, these people would possibly have impaired speech and language abilities, making them unsuitable candidates for content analysis.

Individuals with moderate or greater tinnitus were also excluded from this study, as these are people who may experience tinnitus to a degree where it may cause them distress or anxiety in their day-to-day lives. This study focuses on anxiety related to a HI alone. The participant may associate the tinnitus with the HI, thus resulting in an inflated level of cognitive anxiety.

Finally, it was important that participants were fluent English speakers as it was necessary for participants to be fully able to understand what was required of them, and be able to express themselves completely when answering the interview question.

In short, individuals who met the following criteria were eligible for inclusion in this study:

- Aged 30 years or older;
- Are consulting for services related to their HI for the first time;
- Have a progressive or gradual permanent HI, acquired as an adult (after the age of 30 years);
- Have a three-frequency pure tone average (PTA) of less than 90 dB HL in each ear;
- Do not experience moderate or greater tinnitus;
- Use spoken English as their first language.

2.3 General Procedure

Clients were asked if they would like to participate in the study when they made their first appointment. At that time, they were provided with contact information for the researchers and encouraged to make contact if any questions arose. The information sheet and consent form (Appendices A and B respectively) were mailed or emailed to them along with an appointment reminder prior to the appointment. All participants were booked for a full diagnostic audiological assessment lasting approximately one hour.

On arrival to the clinic, participants were required to complete a form with their personal information for the clinic. This included their age and gender which was provided to the researcher by the audiologist. Participants were taken to a room where the interview could be conducted privately. A single research associate conducted all the interviews and either that person or another audiologist conducted the audiological assessment. The interviewer explained the procedure and any questions the participants had were answered prior to data collection. If the participants were willing to participate in the study, the signed informed consent form was collected. When participants were comfortable, the interview was conducted and recorded using an Olympus DS 5000 digital voice recorder. Any questions participants had were answered and the audiological assessment commenced.

The tests which were used to obtain results for this study are detailed in the *Measures* section below. All participants received an audiological assessment, conducted in sound treated test rooms, following the clinical protocols established by the American Speech Language Hearing Association. Participants also completed the self-assessment measures. Those aged 65 years and over completed the Hearing Handicap Inventory for the Elderly (HHIE: Ventry & Weinstein, 1982) while participants aged 30 to 64 years completed the Hearing Handicap Inventory for Adults (HHIA: Newman, Weinstein, Jacobson, & Hug,

1991). At the conclusion of the assessment, the audiologist explained the results of the tests and any further action, such as a hearing aid trial, that may be appropriate for the participant.

2.4 Measures

The tests used to assess level of cognitive anxiety, audiometric variables, and quality of life are explained below.

2.4.1 Level of cognitive anxiety

Participants were asked to talk for five minutes about their life as a hearing impaired person in response to the following question asked by the interviewer:

“Thank you for agreeing to talk with me about your experience. I want to make sure I fully understand your experience, so I’m going to record this interview. I’d like you to talk to me for about 5 minutes about your life at the moment – the good things and the bad things – what is it like for you, as a person with hearing problems? Once you start talking, I’ll be here listening to you; but I’d rather not reply to any questions you may have until 5 minutes are over. Do you have any questions now, before we begin?”

The interview responses were recorded and then transcribed into a word processing document. All transcripts were typed so that the gender of the participant could not be identified. No other information, such as age or level of HI, was attached to the transcript and was only revealed after the transcripts had been coded. The content was analysed for indications of cognitive anxiety by defining and scoring the clauses within the transcript using the scoring guidelines of Kelly and colleagues (2011; see Table 1 and Figure 2). These guidelines are based on those of Viney and Westbrook (1976) and were refined for use in the communication disorders by DiLollo and colleagues (2003).

Table 1
Criteria for Defining Clauses (Kelly et al., 2011)

Criteria	Examples
Expression of complete thought	“I’ve had a hearing problem since childhood” “now I can hear”
Contains noun and verb	“and that would upset me” “as I look back on it”
Contains unique thought	“which is so stupid” “and also in a restaurant”

- 1) Score each clause only once.
- 2) When a clause emphasizes another clause, score it separately.
- 3) Score a clause when it indicates *difficulty in comprehension*.
- 4) Score a clause when it implies that experience was *not meaningfully integrated*.
- 5) Score a clause when it implies *little or no experience* with topic.
- 6) Score a clause if it reflects *uncertainty* about topic.
- 7) Score a clause if it implies feelings of *guilt or deception* related to topic.
- 8) Score a clause if it implies *denial* of topic.
- 9) Score a clause if it directly states the individual can *only speculate* about topic.
- 10) Don’t score a clause when the speculation is implied or unclear.
- 11) Score a clause when it indicates *surprise that is interpreted as meaning the prediction was inaccurate*.
- 12) Score a clause when it reflects a question that indicates a *lack of understanding*.
- 13) Score a clause when it reflects a question that is a *whole or partial repetition* of the original question.
- 14) Don’t score a clause when it is merely requesting information.
- 15) Score a clause when a cognitive response was *not available or not in the person’s repertoire*.
- 16) Don’t score a clause if the response was omitted by choice.
- 17) Don’t score a clause if the response refers to forgetting or not remembering.
- 18) Don’t score a clause “I don’t know what else to say”.

Figure 2. Guidelines for scoring clauses (Kelly et al., 2011)

Next, the clauses are given a weighting coefficient depending on whether the cognitive anxiety is experienced by the self, experienced by others, or expressed but then denied. These categories are shown in Table 2. Cognitive anxiety referenced to the self is weighted most heavily, with references to others weighted less, and denial of cognitive

anxiety given the least weighting. Finally, the CAS score is calculated using the formula given in Figure 3.

Table 2
Cognitive Anxiety Categories and Weights

Code	Weight	Category
Ca3	3	Cognitive anxiety experienced by self
Cb2	2	Cognitive anxiety experienced by others
Cd1	1	Cognitive anxiety expressed but denied

$$\text{Cognitive Anxiety Scale score} = \sqrt{(\text{Frequency} \times \text{Weight}) \text{C.F.} + \frac{1}{2} \text{C.F.}}$$

Where:
Frequency = total number of times the category is scored
Weight = number indicating degree of personal involvement
C.F. = correction factor of total number of words in sample divided into 100

Figure 3. Cognitive Anxiety Scale formula (Viney & Westbrook, 1976)

Interrater reliability was established prior to the analysis of the transcripts through the use of ‘practice’ transcripts, and also following analysis to establish the reliability of coding of the final data set. The practice transcripts were used to train the main researcher on the coding guidelines and to ensure the consistency of scoring. Following data collection, a second coder independently coded the transcripts, with interclass correlation coefficient and Cronbach’s Alpha used to compare the scores of the main researcher and the second coder.

2.4.2 Audiometric variables

Three audiometric variables were used in this study: hearing impairment, speech in quiet, and speech in noise. The method for measurement of each variable is explained below.

2.4.2.1 Hearing impairment

The HI variable was determined using the PTA of the better ear (BEPTA). The PTA was calculated by averaging the thresholds at 500, 1000, 2000 and 4000 Hz, thus better hearing is characterised by a lower BEPTA. Thresholds were determined through pure tone audiometry which was conducted bilaterally in all cases. Following otoscopy, pure tones were presented to the participant using a calibrated Grason-Stadler GSI 61 clinical audiometer via ER-3A insert earphones for air conduction thresholds and a Radioear BC-71 bone vibrator for bone conduction thresholds. Thresholds were obtained at octave intervals between 250 and 8000 Hz for air conduction and between 500 and 4000 Hz for bone conduction. Contralateral masking was used if the difference between the pure tone air conduction threshold and the pure tone bone conduction threshold was 10 dB HL or greater.

2.4.2.2 Speech in quiet

Fifty-item suprathreshold word recognition scores (WRS) were obtained with ER-3A insert earphones in quiet for each participant. The Auditec CD recordings of the NU-6 monosyllabic word lists (Tillman & Carhart, 1966) were presented to each ear at 40 dB SL re: SRT. Contralateral masking was employed when required. The scores for each ear were summed to determine a score out of 100 for each participant.

2.4.2.3 Speech in noise

Speech in noise was the final audiometric variable measured in this study. The Quick Speech in Noise (QuickSIN) test was developed to quickly provide an estimate of an individual's signal-to-noise ratio loss (SNR loss: Etymotic Research, 2001; Killion, Niquette, Gudmundsen, Revit, & Banerjee, 2004) which cannot be predicted reliably from pure tone data (Killion & Niquette, 2000). The SNR loss corresponds to HI in that it represents the dB

increase in signal-to-noise ratio needed by an individual to understand speech in noise compared with individuals who have normal hearing.

The QuickSIN test is a shortened, revised version of the Speech in Noise (SIN) test, and was developed to resolve problems with the SIN test reported by researchers and clinicians, such as length of time to administer and difficulty with scoring (Killion et al., 2004). Originally developed to estimate the degree of difficulty understanding speech in noise that is representative of performance in daily life (Etymotic Research, 1993; Killion & Vilchur, 1993), the SIN test provides a signal-to-noise ratio (SNR) for 50% correct identification of sentences containing five key words. These sentences are organized into test blocks that were derived from the Institute of Electrical and Electronic Engineers (IEEE: 1969) sentences. The IEEE sentences were designed to contain few contextual cues to assist the listener in understanding (Killion et al., 2004).

Twelve lists of sentences are available with the QuickSIN, with each list requiring approximately one minute to present. Each list contains six sentences, derived from the original SIN test, which are presented binaurally in a competing background of four-talker babble (Killion et al., 2004). The material was pre-recorded at signal-to-noise ratios decreasing in 5 dB steps from 25 to 0 dB. For participants with a PTA of less than or equal to 45 dB HL, the presentation level is 70 dB HL, whereas for those with a PTA greater than 45 dB HL, the presentation level is “loud, but OK” (Valente & van Vliet, 1997). Participants listen to each sentence and repeat what they hear immediately following presentation. Five target words are embedded in each sentence, and one point is awarded for correctly repeating each word.

To calculate the SNR loss the following formula is used: $\text{SNR loss} = 25.5 - \text{Total Words Correct}$. Killion and colleagues (2004) stated that this formula was derived from the Tillman and Olsen method for obtaining spondee thresholds (Tillman & Olsen, 1973). In this method, the starting level is added to one-half of the step size. The total number of words repeated correctly is subtracted from this sum to obtain the speech recognition threshold. The highest SNR in the QuickSIN is 25 dB and the step size is 5 dB. Following the Tillman and Olsen (1973) formula, Killion and colleagues (2004) derived the formula $27.5 - \text{total number of words repeated correctly}$ to obtain SNR-50, which is a measure of the signal-to-noise ratio required for listeners to correctly repeat 50% of the words. Because the SNR-50 for listeners with normal hearing is 2 dB, this amount is subtracted from the SNR-50 formula to obtain SNR loss: $25.5 - \text{total words correct}$.

When using a single QuickSIN list, Killion and colleagues (Etymotic Research, 2001) reported the 95% confidence interval is ± 2.7 dB. To increase accuracy and decrease the size of the confidence interval, multiple lists can be averaged to derive the SNR loss. The 95% confidence interval, as measured and reported by Killion and colleagues (Etymotic Research, 2001) for four QuickSIN lists is ± 1.4 dB. For this study, two practice lists were administered followed by two test lists. The SNR loss from the two test lists were averaged to derive the SNR loss for each participant.

2.4.3 Quality of life

Quality of life was determined using the Hearing Handicap Inventory (HHI) for the elderly or adult. The HHIE (see Appendix C) enables the assessment of perceived effect of HI in the elderly. Included in the HHIE are two subscales: the Emotional Scale, measuring the client's emotional responses to the HI, and the Social Scale, measuring the perceived impact of the HI in various social situations (Ventry & Weinstein, 1982). Participants select

‘yes’, ‘sometimes’ or ‘no’ in response to 25 questions relating to circumstances in which they may struggle with their inability to hear. Thirteen questions address the emotional aspect of the HI whereas the remaining 12 questions address social aspects. Answers are scored with 4 for ‘yes’, 2 for ‘sometimes’ and 0 for ‘no’, with a maximum score of 52 for the Emotional subscale and 48 for the Social subscale. The scores generated from these subscales are combined to give a total level of hearing handicap. The questionnaire should not take longer than five minutes for the participant to complete.

The HHIA (see Appendix D) was developed for use with clients under the age of 65 (Newman et al., 1991), and is largely the same as the HHIE. The only differences are that an occupational setting was incorporated for an Emotional and a Social question, while another Social question was altered to involve a leisure activity. The number of questions and scoring remain the same.

Weinstein et al. (1986) demonstrated the reliability of the HHIE, while the HHIA has shown positive internal and test-retest reliability scores (Newman et al., 1991).

2.5 Statistical Methods

All data were entered and analysed using The Statistical Package for the Social Sciences (SPSS version 19). Several statistical tests were selected depending on the characteristics of the data and analyses required.

A Pearson product-moment correlation was used to determine the relationships between CAS score, age, BEPTA, WRS, SNR loss, and score on the HHI. A p value of $< .05$ was deemed to be significant.

Two-tailed Mann-Whitney U tests were utilized to compare the CAS scores between genders and between hearing aid adopters and non-adopters. The Mann-Whitney U test is a non-parametric test designed to be used in place of the t-test when parametric assumptions are not met. In this instance, assumptions of population normality and homogeneity of variance could not be satisfied. Again, a p value of $< .05$ will indicate significance. Cohen's d was used to express effect size.

Finally a chi-squared test was used to compare the hearing aid adopters to the non-adopters in terms of gender.

2.6 Ethical Considerations

Ethical approval was granted by the University of Canterbury Human Ethics Committee on 01 February 2012. All procedures conducted during this study were in accordance with this approval. Informed consent forms were signed by all participants.

Chapter Three: Results

3.1 Reliability of Coding

Reliability of the coding was judged by comparing the Cognitive Anxiety Scale (CAS) scores of the main researcher and a second, independent coder. The CAS scores assigned to each participant are illustrated in Figure 4. Two tests were utilized to assess the reliability of the coding by the coders: The intraclass correlation coefficient and Cronbach's Alpha.

The intraclass correlation coefficient is used to assess the reliability of coding by way of analysis of variance. A two-way mixed model was selected due to the participant transcripts being coded by the same two coders who are the only coders of interest in this study. The single measures result was selected as the reliability analysis was based on a comparison of scores of the two coders, rather than the mean of several coders. The intraclass correlation for this study was .99 ($p < .001$) indicating excellent agreement between the two independent coders.

Along with the value for intraclass correlation, SPSS determines Cronbach's Alpha. Although typically used to determine internal consistency within a scale, in this instance the alpha value can be interpreted as the extent to which the group of values is measuring cognitive anxiety. The value of Cronbach's Alpha was .993 indicating that indeed the scores are measuring a single construct; in this case, cognitive anxiety.

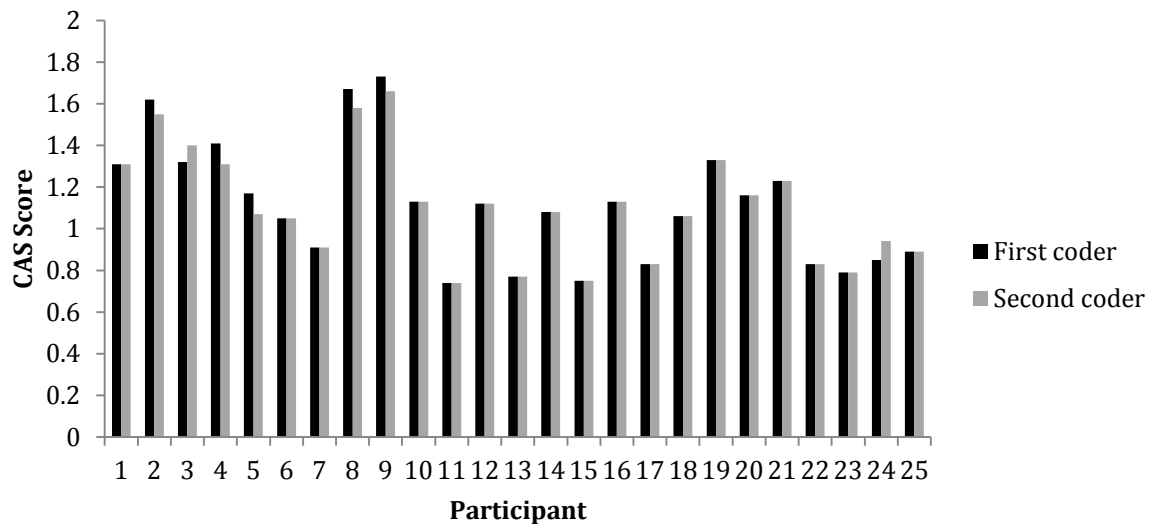


Figure 4. Comparison of CAS scores between first and second coders

3.2 Sample Characteristics

Twenty-seven participants agreed to participate in this study, however it was found during content analysis that two did not meet the inclusion criteria and were thus excluded from further analysis. This left 25 participants for which the descriptive statistics for CAS score, age, better-ear pure tone average (BEPTA), word recognition score (WRS), speech in noise ratio loss (SNR loss), and Hearing Handicap Inventory (HHI) for the elderly or adult score are presented in Table 3. Due to technical difficulties, SNR loss was only obtained for 17 participants. Sixteen of the 25 participants chose to adopt hearing aids, leaving nine non-adopters.

Table 3
Descriptive Statistics for the Total Sample

	Mean	SD	Median	Minimum	Maximum
CAS score	1.12	.29	1.12	.74	1.73
Age (years)	63.56	4.85	64	52	71
BEPTA (db HL)	40.01	7.87	40	30	55
WRS	88.24	2.03	88	84	92
SNR loss	3.85	1.07	4	2.5	5.5
HHI	28.32	11.73	28	10	56

3.3 Correlations

Table 4 shows the results of one-tailed Pearson product-moment correlations for the variables of CAS score, age, BEPTA, WRS, SNR loss, and HHI score. Figures 5, 6, 7, 8, and 9 show the relationships between CAS score and age, BEPTA, WRS, SNR loss, and HHI score. It was hypothesized that CAS level is negatively correlated with age and WRS, and positively correlated with BEPTA, SNR loss, and quality of life (HHI). Contrary to the study hypothesis, no relationships were found between CAS score and age ($r(23) = .066$, $p = .377$) and between CAS score and WRS ($r(23) = .181$, $p = .193$). In contrast, there were indeed positive relationships between CAS score and SNR loss ($r(15) = .682$, $p = .001$), CAS score and score on the HHI ($r(23) = .471$, $p = .010$) and between CAS score and BEPTA ($r(23) = .260$, $p = .105$), although the latter result was not significant.

Not surprisingly, a positive, significant relationship was found between age and BEPTA ($r(23) = .562$, $p = .002$). There were also significant positive correlations between WRS and HHI score ($r(23) = .361$, $p = .038$), and SNR loss and HHI score ($r(15) = .492$, $p = .230$). The relationships between BEPTA and HHI score ($r(23) = .270$, $p = .100$) and BEPTA and SNR loss ($r(15) = .228$, $p = .190$) were positive, but not significant. There were no relationships between age and score on the HHI ($r(23) = -.049$, $p = .410$). WRS was not correlated with age ($r(23) = .028$, $p = .447$), BEPTA ($r(23) = -.113$, $p = .295$), or SNR loss ($r(15) = .364$, $p = .075$), and SNR loss was not correlated with age ($r(15) = -.100$, $p = .351$).

Table 4

Correlation Matrix between CAS Score, Age, BEPTA, WRS, SNR loss, and HHI Variables

	1	2	3	4	5	6
1 CAS Score	1.00	.066	.260	.181	.682*	.471*
2 Age		1.00	.562*	.028	-.100	-.049
3 BEPTA			1.00	-.113	.228	.270
4 WRS				1.00	.364	.361*
5 SNR loss					1.00	.492*
6 HHI						1.00

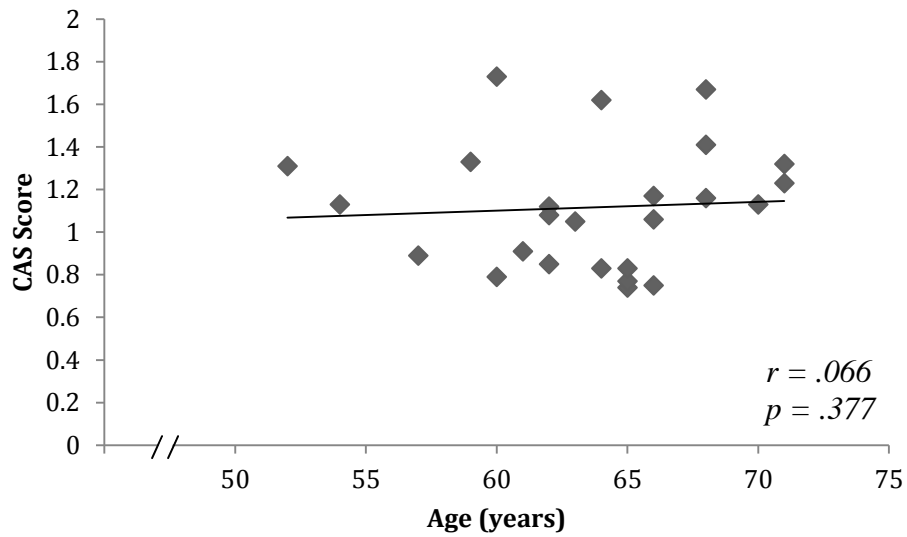
* $p < .05$ 

Figure 5. Age plotted against CAS score for all participants

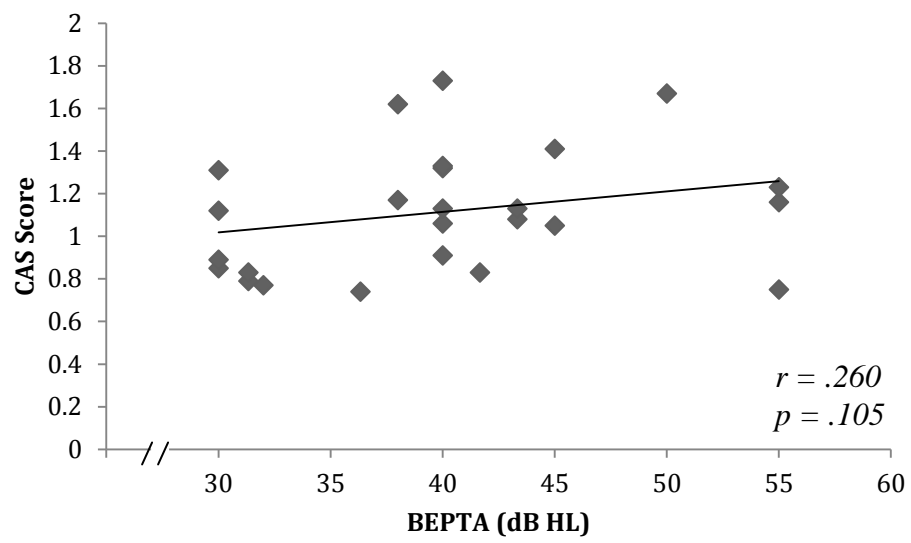


Figure 6. BEPTA plotted against CAS score for all participants

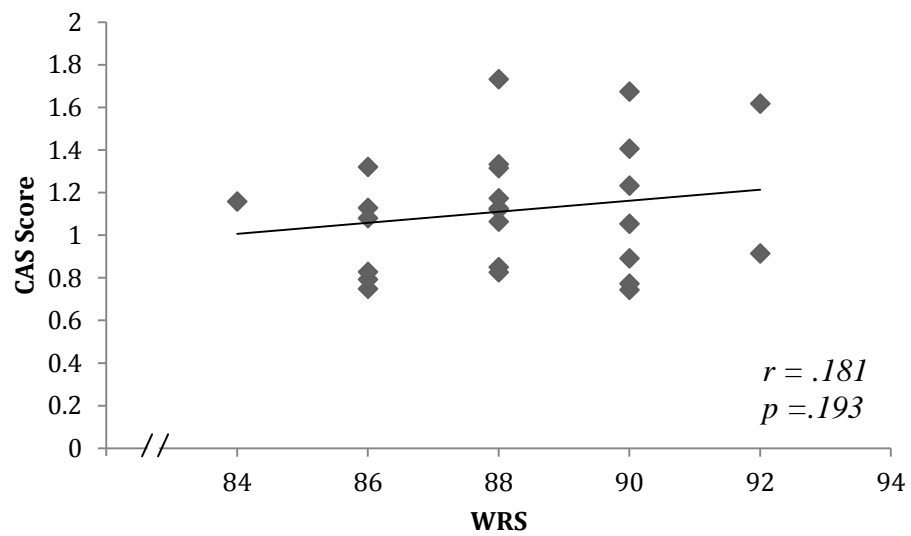


Figure 7. WRS score plotted against CAS score for all participants

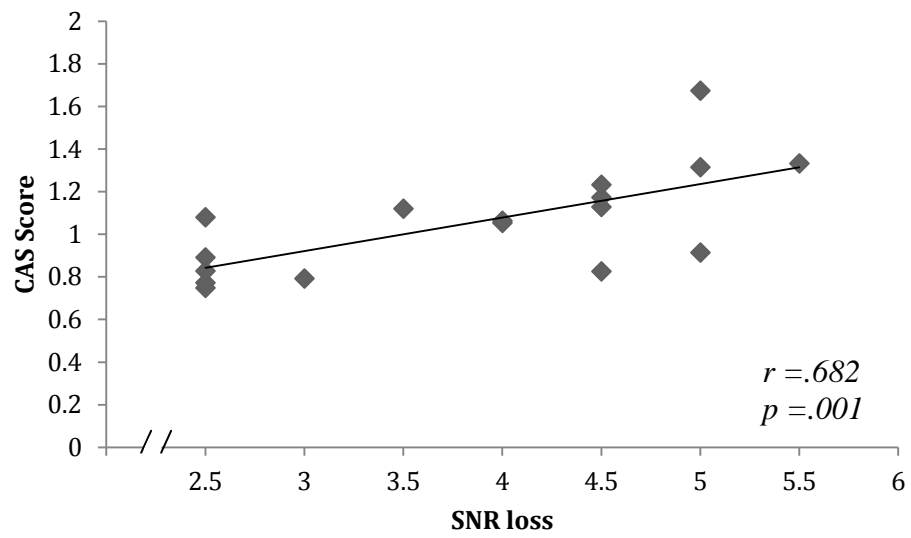


Figure 8. SNR loss plotted against CAS Score for 17 participants

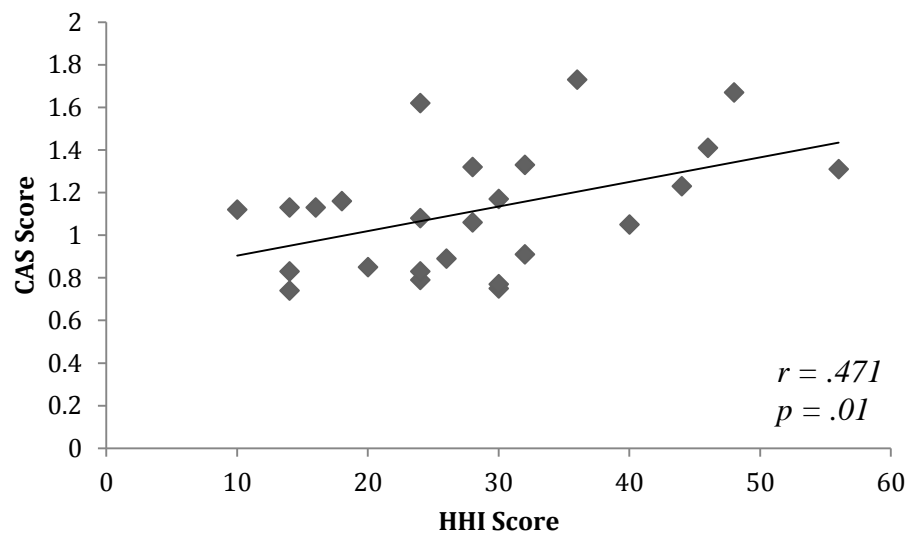


Figure 9. HHI score plotted against CAS score for all participants

3.4 Mann-Whitney U tests

As the assumptions of normal distribution were not met, when investigating the difference in CAS score between genders and between hearing aid adopters and non-adopters 2-tailed Mann-Whitney U-tests were employed.

3.4.1 Gender

Table 5 shows the results of the Mann-Whitney U tests when comparing CAS score, age, BEPTA, WRS, and HHI score between male ($n = 15$) and female participants ($n = 10$). The comparison between genders for SNR loss was conducted with data from nine men and eight women. It was hypothesized that CAS levels would be significantly higher for women than men, however the test revealed no significant difference between genders ($U = 56.00$, $p = .29$, $d = .64$). Figure 10 shows individual CAS scores for the participants within the male and female groups. There were also no significant differences between the male and female participants in terms of age ($U = 59.50$, $p = .39$, $d = .33$), BEPTA ($U = 66.50$, $p = .63$, $d = .12$), WRS ($U = 47.5$, $p = .11$, $d = .72$), SNR loss ($U = 36$, $p = > .99$, $d = -.04$), and score on the HHI ($U = 51.00$, $p = .18$, $d = .55$).

Table 5
Results of Mann-Whitney U Tests for Comparison between Genders

		Mean	SD	Median	Mean Rank	Mann-Whitney U	Z	Sig (2-tailed)	Cohen's d
CAS score	M	1.19	.32	1.13	14.27	56.00	-1.05	.29	.66
	F	1.01	.20	.98	11.10				
Age	M	64.2	1.20	65	14.03	59.50	-.86	.39	.32
	F	62.6	1.65	63	11.45				
BEPTA (dB HL)	M	40.40	6.97	40	13.57	66.50	-.48	.63	.12
	F	39.43	9.42	40	12.15				
WRS	M	88.8	1.97	88	14.83	47.5	-1.59	.11	.72
	F	87.4	1.90	88	10.25				
SNR loss	M	3.83	1.12	4	9	36	0	1	-.04
	F	3.88	1.09	4.25	9				
HHI	M	30.8	3.36	30	14.60	51.00	-1.34	.18	.56
	F	24.6	2.78	24	10.60				

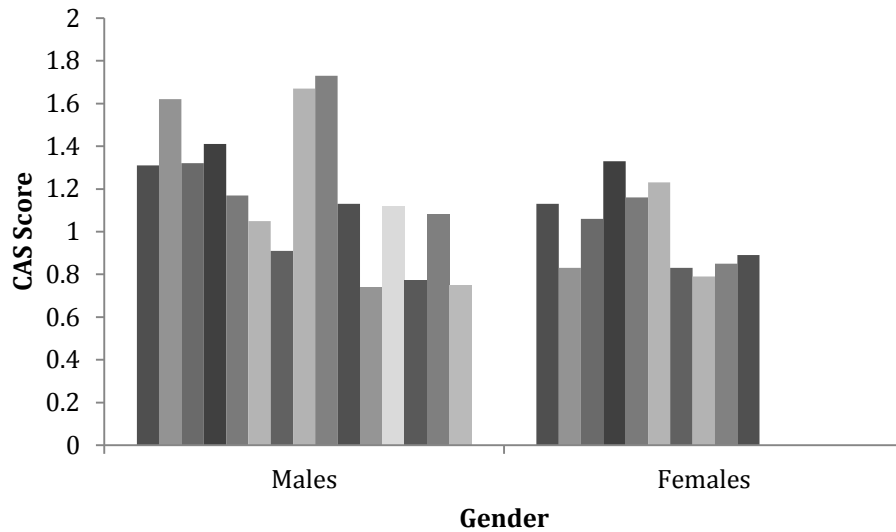


Figure 10. CAS score for each participant within the male and female groups

3.4.2 Hearing aid adoption

The results of the Mann-Whitney U tests for CAS score, age, BEPTA, WRS, SNR loss, and HHI score between the hearing aid adopters and non-adopters are shown in Table 6. The analysis for comparison between groups for SNR loss was run with data from 10 adopters and 7 non-adopters. A significant difference was found between the adopters ($n = 16$) and non-adopters ($n = 9$) with regard to CAS score ($U = 11.00$, $p = .001$, $d = 1.72$), in support of the hypothesis that CAS levels would be significantly higher for hearing aid adopters. Figure 11 shows the individual CAS scores for each participant within the adopter and non-adopter groups.

Not surprisingly, significant differences were also found between the two groups in terms of BEPTA ($U = 31.00$, $p = .02$, $d = .98$), SNR loss ($U = 0$, $p < .01$, $d = 4.44$), and score on the HHI ($U = 32$, $p = .02$, $d = 1.02$), with hearing aid adopters exhibiting significantly greater hearing impairment (HI), more difficulty with speech in noise, and reporting greater

effects of HI. No significant difference was found in terms of age ($U = 51$, $p = .23$, $d = 0.32$) or WRS ($U = 57$, $p = .376$, $d = .36$).

Table 6
Results of Mann-Whitney U Tests for Comparison between Hearing Aid Adopters (A) and Non-Adopters (NA)

		Mean	SD	Median	Mean Rank	Mann-Whitney U	Z	Sig (2-tailed)	Cohen's d
CAS score	A	1.25	.26	1.20	16.81	11.00	-3.45	.001	1.86
	NA	.87	.14	.83	6.22				
Age	A	64.13	5.69	65.50	14.31	51.00	-1.19	.23	.35
	NA	62.56	2.83	62	10.67				
BEPTA (dB HL)	A	42.56	6.41	40	15.56	31.00	-2.35	.02	.94
	NA	35.48	8.51	24	8.44				
WRS	A	88.5	2.13	88	13.94	57	-.89	.376	.36
	NA	87.78	1.86	88	11.33				
SNRLoss	A	4.65	.47	4.5	12.5	0	-3.49	<.001	4.44
	NA	2.71	.39	2.5	4				
HHI	A	32.25	12.08	31	15.50	32.00	-2.27	.02	1.09
	NA	21.33	7.28	31.33	8.56				

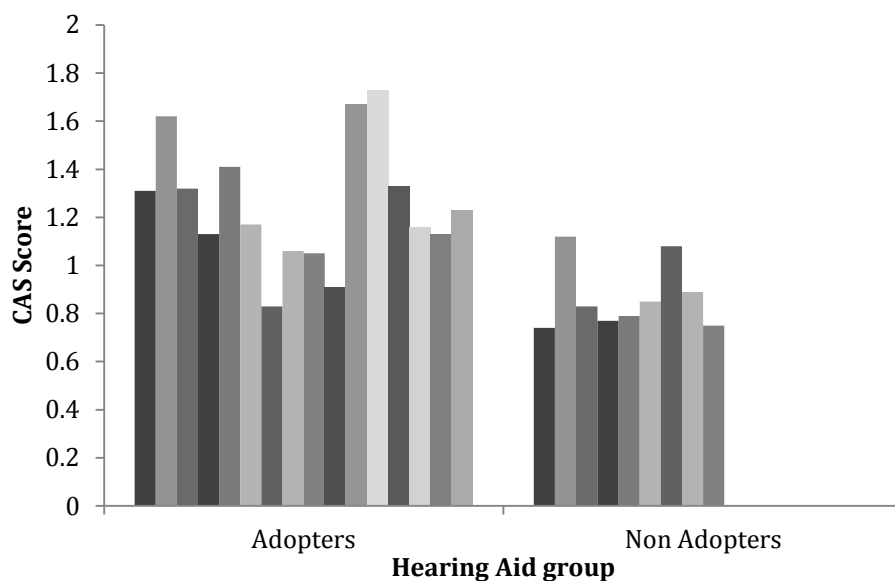


Figure 11. CAS score for each participant within the adopter and non-adopter groups

3.5 Chi-square

A chi-square test of independence was performed to examine the relation between gender and hearing aid adoption. The test showed that hearing aid adopters (men = 10,

women = 6) did not differ from the non-adopters (men = 5, women = 4) in terms of gender ($\chi^2(1, 25) = .12, p = .73$).

Chapter Four: Discussion

The present study aimed to investigate the relationships between cognitive anxiety and age, gender, audiometric variables, quality of life (QoL), and hearing aid adoption. To do so, the Cognitive Anxiety Scale (CAS; Viney & Westbrook, 1976) was employed for use with a group of 25 hearing impaired adults who were consulting an audiologist for the first time. The demographic variables, three-frequency pure tone average of the better ear (BEPTA), word recognition score (WRS), speech in noise ratio loss (SNR loss), result of the Hearing Handicap Inventory (HHI) for the Elderly or Adult, and hearing aid status were supplied by the audiologist for each participant along with the transcript from the interview. Pearson product-moment correlational analyses were conducted to identify any relationships between the variables, while Mann-Whitney U tests were employed to determine differences between gender and hearing aid groups. A discussion of the findings follows.

4.1 Relationship between Cognitive Anxiety Level and Age

The first hypothesis tested in this study was that level of cognitive anxiety would be negatively correlated with age, with younger adults exhibiting higher CAS scores. The finding that there was no correlation between CAS score and age does not support this hypothesis. This supports the results of Viney & Westbrook (1976) who also found that level of cognitive anxiety was not related to age.

It has been reported that in regard to age and its relationship to anxiety disorders or symptoms, older people experience less anxiety than younger people. According to the research, older people experience less worry (Brenes, 2006) and have lower prevalences for anxiety disorders (Gum et al., 2009; Jorm, 2000; Wells et al., 2006). Fuentes and Cox (2000),

on the other hand, found no difference in the prevalence of anxiety symptoms between younger and older adults.

Few studies are available investigating the relationship between anxiety and age with hearing impaired individuals. As mentioned earlier, Tambs (2004) reported that the effects of low-frequency hearing loss on anxiety decreased significantly with age. One explanation given by Tambs (2004) was that while older people may view hearing impairment (HI) as a normal part of aging, young people may see their HI as something that differentiates them from their peers. Nachtegaal et al. (2009), however, found a significant association between anxiety and level of HI for those in the age group of 40 to 49 years only, with no significant results reported for any other age group between 18 and 70 years.

Thus, there are several possible reasons as to why a significant result was not obtained in the present study. Firstly, it is possible that level of anxiety in general does not vary with age in the hearing impaired population. The results of Tambs (2004) and Nachtegaal and colleagues (2009) are inconsistent and provide no reliable pattern in terms of anxiety and age. Following from this, it is possible that level of cognitive anxiety, as measured using the CAS, does not vary with age. In their early study, Viney and Westbrook (1976) did not find a relationship between these two variables in a population of new mothers. It could be suggested that the variation in cognitive anxiety scores is not a result of varying age, but is due to other factors, such as personality, coping styles, or environmental factors such as social support. Further research could investigate such factors and their relationship to cognitive anxiety in various populations.

Another reason as to why cognitive anxiety has not been shown to vary with age is the particular sample studied. Viney and Westbrook's (1976) sample consisted of 200 new

mothers aged between 17 and 45 years, while the population of the current study consisted of 25 individuals with HI aged between 52 and 71. Both studies had relatively narrow age ranges and the sample size of the present study was small. It is possible that differences in cognitive anxiety across the ages were not present because elderly individuals were not included in the former study, and younger adults not involved in the latter. Studies investigating large sample sizes consisting of both younger and older participants may be able to identify a significant relationship between cognitive anxiety and age.

4.2 Relationship between Cognitive Anxiety Level and Gender

The second hypothesis posed in this study was that level of cognitive anxiety would be significantly higher for women than men. This hypothesis was not supported as statistical analysis revealed no significant difference between the gender groups. Gender differences in cognitive anxiety have not been investigated in the HI population, or any population as yet. Thus, this result cannot be compared to previous research in this area.

With regard to anxiety in the general population, it is widely reported that women experience more anxiety than men (Brenes, 2006; McLean et al., 2011; Wells et al., 2006), particularly in the older population (Beekman et al., 1998; de Beurs et al., 2000; Fuentes & Cox, 2000; Mehta et al., 2003). This gender effect has also been found in the hearing impaired population (Garstecki & Erler, 1999; Helvik et al., 2006a), yet other studies have not identified this difference (Andersson & Green, 1995; Hallberg et al., 2008; Nachtegaal et al., 2009).

Regarding the present study, one important point to note is that although a significant difference was not found between the genders, effect size, as given by Cohen's *d*, was .64. Effect size refers to the magnitude of the result (Lipsey, 1990). Cohen's *d* is calculated by

dividing the mean difference between the two groups by the standard deviation for the data. In behavioural science research, an effect size of .64 falls between a 'medium' and a 'large' effect size (Cohen, 1988). A larger effect size generally means a greater chance of identifying a significant difference between two groups, along with greater statistical power (Lipsey, 1990). Thus, the result here could be called 'inconclusive' rather than not significant. Looking at the data, there is a difference in the medians between the gender groups. The medium effect size suggests there is a measurable difference, however statistical significance could not be reached due to the small sample and use of non-parametric statistics, and consequently, decreased statistical power. It is possible that with a greater sample size, use of parametric statistics, and therefore more statistical power, a significant result would be reached.

On the other hand, even with increased statistical power a significant difference may not be found because a difference between men and women may not in fact exist for cognitive anxiety. One reason suggested for the apparent gender difference in general anxiety is gender roles; it is generally more acceptable for women to admit to feelings of fear and anxiety, while men are less willing to talk of such feelings (Bekker & van Mens-Verhulst, 2007; McLean & Anderson, 2009). This can create a bias in the data and affect the results of self-report measures. The CAS, however, does not rely on self-report of feelings. Thus, it is possible that for cognitive anxiety, there is indeed no significant difference between the genders; cognitive anxiety is experienced to the same degree by both men and women. Future research with a larger sample size is needed to investigate this area and determine whether there is, or is not, a gender difference in cognitive anxiety.

4.3 Relationship between Cognitive Anxiety Level and Audiometric

Variables

The third hypothesis tested in this study was that level of cognitive anxiety would be higher in those with a greater level of HI as given by their audiometric variables. Three variables were measured to determine HI: BEPTA, WRS, and SNR loss. Analyses were conducted with each variable separately. The data suggest a weak, positive correlation between CAS and BEPTA in support of the hypothesis, although the result was not significant. Also not significant was the relationship between CAS and WRS. The relationship between CAS and SNR loss, however, did show a significant positive correlation.

Previous research investigating the link between anxiety and HI has produced mixed results. While some studies have established a relationship (Kent & La Grow, 2007; Mehta et al., 2003), others have reported a trend that did not reach significance (Helvik et al., 2006b), or have found an association for only one specific age group (Nachtegaal et al., 2009) or for a certain type of HI (Tambs, 2004). Further research has identified relationships between anxiety and speech discrimination (Eriksson-Mangold & Carlsson, 1991), use of maladaptive communication strategies (Öberg et al., 2007), greater activity limitation and participation restriction because of a HI (Öberg et al., 2007), and acceptance of the HI (Kent & La Grow, 2007).

The simplest explanation for why this result did not reach significance is, once again, sample size. With a greater number of participants, this result may have reached significance; however, the relationship was only a weak one regardless. Another reason, relating to the literature, is that because this sample consisted of participants with a gradual HI, it may be that those with greater HI have had more time to adapt, and therefore have accepted their HI.

Kent and La Grow (2007) found that anxiety was negatively correlated with acceptance, indicating that either those who have accepted their HI are less likely to experience anxiety, or those who are less anxious are more likely to be accepting of their HI. It could be, however, that there is a moderator or mediator variable influencing this relationship.

Another possible reason for the relationship between CAS and BEPTA not reaching significance is that cognitive anxiety may not be related to pure tone thresholds. Eriksson-Mangold and Carlsson (1991) found that anxiety was significantly correlated to speech discrimination, but not pure tone thresholds. Recall that cognitive anxiety can occur when hearing impaired individuals do not have full access to speech that is communicated to them and they are unable to anticipate and meaningfully interpret the event (Kelly et al., 2011). While an audiogram may show a HI, the individual's ability to use non-verbal cues when communicating may result in decreased feelings of anxiety regarding social situations. Thus, in the case of cognitive anxiety, speech discrimination is a variable worthy of investigation, especially considering that cognitive anxiety is likely to occur in conversational situations.

Nevertheless, as reported above, the relationship between cognitive anxiety and speech in quiet was not significant, in contrast to the finding by Eriksson-Mangold and Carlsson (1991). Their study, which involved 48 adults aged between 55 and 74 years, found that speech discrimination of the better ear, measured using phonetically balanced monosyllabic Swedish word lists, was significantly correlated to anxiety. One of the possible reasons as to why these findings contrast is the measures used. Whereas the present study employed the CAS to measure state anxiety, Eriksson-Mangold and Carlsson (1991) used a self-report questionnaire, the Symptom Checklist-90 (SCL-90: Derogatis, Rickels, & Rock, 1976). Anxiety is one of 10 dimensions assessed in the SCL-90, and Eriksson-Mangold and Carlsson (1991) asked their participants to think about their symptoms during 'the last couple

of days' (p. 731). Thus, the CAS and the SCL-90 are very different tools used in the assessment of anxiety, with the SCL-90 requiring individuals to be aware of their anxiety and report their feelings to the researcher by completing a questionnaire.

Another reason as to why CAS score was not related to WRS is because the ability to discriminate speech in quiet may not be relevant for cognitive anxiety, corresponding to the result between cognitive anxiety and BEPTA. As previously stated, cognitive anxiety occurs in situations where hearing impaired individuals do not have full access to speech that is communicated to them (Kelly et al., 2011). If hearing impaired individuals do not have difficulty with speech in quiet situations, they are unlikely to experience cognitive anxiety. Speech in noise, on the other hand, is likely to pose significant problems, and this is evident in the significant relationship between CAS score and SNR loss. In a noisy environment, the hearing impaired individual is likely to face problems with hearing what is being communicated. In this instance, cognitive anxiety can arise because the individual cannot predict when a communication breakdown will occur due to what is being missed in the conversation (Kelly et al., 2011).

4.4 Relationship between Cognitive Anxiety Level and Quality of Life

The fourth hypothesis posed in this study was that level of cognitive anxiety would be higher in those with greater self-perceived hearing problems (QoL). This hypothesis was supported, with a significant, moderate correlation found between CAS score and HHI score. Once again, this result cannot be compared to the previous research as published data on the relationship between cognitive anxiety and quality of life could not be found.

In terms of general anxiety and QoL, there seems to be a relationship between these two variables. Reduced QoL has been found in those with anxiety disorders (Rapaport, Clary,

Fayyad, & Endicott, 2005) and those experiencing anxiety symptoms (Brenes, 2007; Strine et al., 2005). In regard to the hearing impaired population, the relationship between anxiety and QoL has not been investigated. As associations between perceived HI and anxiety, and between perceived HI and QoL have been identified in the literature, however it is possible that a relationship exists between these three variables. If a relationship did exist, one of these variables may be acting as a moderator variable, affecting the relationship between the other two variables, or as a mediator variable, explaining the relationship. In any case, the significant result of the current study has indeed identified a relationship between these variables.

It is possible that the CAS and the HHI are measuring related processes. Individuals who experience more problems due to their HI in their daily lives are likely to present with higher scores on both the HHI and the CAS. If perceived hearing handicap is greater, an individual is likely to have problems in communication situations. As stated above, cognitive anxiety is expected to occur because of these situations. Thus, an individual with a high level of hearing handicap is probably also experiencing a high degree of cognitive anxiety. Although two different constructs are being measured, the results of both are possibly linked to difficulties with situations in which individuals are required to listen and respond to communication partners.

One important point is that the ways in which cognitive anxiety and QoL were measured in this study are quite different. Whereas the HHI is a self-report measure, requiring people to identify the situations where they encounter problems, the CAS does not have this requirement, which has been noted as one of the advantages of using this scale; people do not need to be aware of feeling tense or nervous (Kelly et al., 2011). Rather,

participants talk about their experiences with HI in whichever manner they please, and their transcript is then analysed for cognitive anxiety.

4.5 Relationship between Cognitive Anxiety Level and Hearing Aid

Adoption

The final hypothesis tested was that level of cognitive anxiety would be greater in those who choose to adopt hearing aids when compared to those who choose not to adopt. A significant difference was found between adopters and non-adopters, in support of this hypothesis. This result suggests that cognitive anxiety is potentially an influential factor in the decision to adopt hearing aids. Again, no comparison can be made to prior research with these variables.

Given that cognitive anxiety and QoL were found to be related, and that QoL is a factor related to hearing aid uptake as seen in this study and in the literature (Chang et al., 2009; Fischer et al., 2011), it is not surprising that those who adopted hearing aids exhibited higher levels of cognitive anxiety. There are several possible reasons for this finding. First, it is possible that cognitive anxiety is one of the reasons why people seek services from an audiologist. In their recent study, Kelly, Neimeyer and Wark (2011) found that adults with HI who were consulting for the first time displayed significantly higher cognitive anxiety scores than those who were not yet seeking services for their hearing. The presence of cognitive anxiety may add to the impact of the HI, further prompting the individual to seek help and potentially adopt hearing aids.

Previous research has found that hearing aid adopters experience greater difficulty in one-to-one conversations and group situations (Hogan et al., 2001), and a decreased ability to understand speech-in-noise (Robertson et al., 2012). These findings tie in with the experience

of cognitive anxiety. Kelly and colleagues (2011) stated that cognitive anxiety can occur when a hearing impaired individual is unable to predict when a communication breakdown will occur due to what is being missed in a conversation. Thus, the finding that hearing aid adopters experience greater levels of cognitive anxiety connects to the literature well; those who go on to adopt hearing aids are likely to experience difficulties in conversational situations, particularly noisy situations, and therefore are likely to experience cognitive anxiety.

Currently, it is not possible to draw causal conclusions about this relationship as this was a descriptive study, rather than a true experimental study. Thus, it cannot be said that cognitive anxiety causes people to adopt hearing aids, or that seeking services and adopting hearing aids causes cognitive anxiety. In order to determine causal relationships, a larger sample size is required, whereby it would be possible to examine cognitive anxiety, hearing handicap, and SNR loss as possible moderator or mediator variables.

4.6 Other Findings

Although not hypothesized for, the data were analysed to determine the relationships between all study variables.

4.6.1 Relationships between audiometric variables

Interestingly, there were no correlations between the audiometric variables of BEPTA, WRS and SNR loss, although there was a weak positive relationship between WRS and SNR loss that did not reach significance. In terms of the relationship between BEPTA and WRS, Eriksson-Mangold and Carlsson (1991) reported a significant correlation between the two variables, in contrast to the findings here. As mentioned earlier, they used phonetically balanced monosyllabic Swedish word lists, and the scores were correlated with a

five-frequency PTA (.5, 1, 2, 3, and 4 kHz). The authors also employed a three-frequency PTA, the same as used in this study, but did not mention a correlation between this PTA and the speech discrimination scores, thus it can be assumed that there was no significant relationship, in support of the result of the present study.

Clearly the tests for BEPTA, WRS, and SNR loss are different and measure different abilities: the ability to recognise a tone in quiet, the ability to discriminate speech in quiet, and the ability to understand speech in the presence of background noise. Whereas one hearing impaired adult may have difficulty with only speech in noise, another may have difficulty in all three areas. Thus, measurement of all three variables is an important part of the audiological assessment. It is necessary to identify which area or areas an individual has difficulty with in order to determine the correct approach for rehabilitation.

4.6.2 Relationship between audiometric and demographic variables

As expected, there was a significant, positive correlation between age and BEPTA, with greater HI found in those of older age. This finding supports the results of several large studies published in the 1990s. Among a cohort of 63 to 95 year olds, it was found that hearing thresholds declined as age increased (Gates et al., 1990) and the results of a longitudinal study conducted with participants aged between 20 and 90 years were in agreement with this, finding that hearing sensitivity declines over time (Pearson et al., 1995). Finally, the results from the Beaver Dam Epidemiology of Hearing Loss study were also in support, with the results from a cohort of 48 to 92 year olds demonstrating the increase in prevalence of HI with age (Cruickshanks et al., 1998). Overall, 46% of the group had a HI, with this increasing to 89.5% in those aged over 80 (Cruickshanks et al., 1998). More recently, Helvik et al. (2006b), and Hickson and colleagues (2008) reported the increase in HI with age.

The relationships between age and the audiometric variables of WRS and SNR loss, however, were not significant. This is surprising, given the relationship between age and BEPTA, although it is not completely unexpected due to the lack of correlations between BEPTA, WRS, and SNR loss as explained above. Gates et al., (1990), on the other hand, reported a significant relationship between age and word recognition. Their method was different to that of the current study, however, in that the different word lists were used and the test was conducted at 50 dB in the better ear in participants with a BEPTA of 50 dB HL or less. Their study also included a larger sample with a greater age range, indicating that perhaps these are necessary to identify a relationship between age and speech discrimination in a sample of hearing impaired adults.

In terms of gender, when comparing male and female participants and their audiometric results, no significant differences were found between the groups in the present study. This finding does not support the literature which suggests that men are more likely to have a HI than women (Cruickshanks et al., 1998; Gates et al., 1990; Hogan et al., 2001). After adjusting for age, Cruickshanks and colleagues (1998) found that men were more than four times as likely to show a HI, while Pearson and colleagues (1995) reported that the rate of decline is twice as fast in men as it is in women. However, this rate of change begins to level out after age 60, and by age 80 the rate is not significantly different between the genders.

Interestingly, the effect size for the relationship between gender and WRS was .72, indicating a medium effect. This implies that a larger sample is needed in order to increase statistical power, and therefore increase the probability of a significant result. In contrast to the studies above, Hickson et al. (2008) did not find a significant difference between genders in regard to BEPTA, and one possible reason for this is the small sample size. While the

above studies had over 1000 participants, Hickson and colleagues (2008) had less than 200, and current study had 25. Perhaps in order to establish a gender difference in terms of HI, a much larger sample size is required. Furthermore, because both the Hickson et al. (2008) study and the present study were smaller studies investigating specific hypotheses relating to HI, it was required that participants have a HI to be eligible for participation; the three larger studies did not. Thus, factors involving both the sample size and the sample characteristics may have lead to the result found in this study.

4.6.3 Relationship between audiometric variables and quality of life

It is expected that individuals with greater HI will exhibit reduced QoL. In the present study, a weak, positive relationship was found between BEPTA and QoL, however the result was not significant. On the other hand, significant positive correlations were found for WRS and QoL, and SNR loss and QoL.

The finding that BEPTA was not significantly related to QoL is in contrast to several studies which have shown these variables to be positively and significantly correlated. Conversely, the result does agree with other research which has not been able to establish a significant link. As mentioned earlier, researchers have demonstrated a relationship between degree of HI and QoL, as measured using the HHI (e.g., Chang, Ho, & Chou, 2009; Chew & Yeak, 2010; Cruickshanks et al., 1998; Dalton et al., 2003; Newman, Weinstein, Jacobson, & Hug, 1990; Ventry & Weinstein, 1982). In contrast, Menegotto, Soldera, Anderle, & Anhaia (2011) did not find a significant relationship. Menegotto and colleagues (2011) used the screening versions of the HHIE and HHIA in a group of 51 adults aged 18 to 88 years. Firstly, this is a large age range, over a small number of participants, suggesting that sampling characteristics may have had an effect on the results. Also, it could be that perhaps the QoL measures were not suited to the Brazilian population, however, Aiello, de Lima, &

Ferrari (2011) reported the validity and reliability of the scales in the same year for a Brazilian sample.

As mentioned earlier, however, it is clear that the effects of HI are not based solely on the degree of HI itself, but other factors in the life of the individual affected. Nondahl and colleagues (1998) reiterated this, stating that it is not surprising the HHIE demonstrated poor sensitivity and accuracy in their study, given that measured HI accounts for less than 50% of perceived handicap (Ventry & Weinstein, 1983). The World Health Organization's (2001) ICF model clearly illustrates the interplay between the health condition, environmental factors, and personal factors, and how this can impact upon daily life in terms of an individual's activities and participation in society. For the present study, a weak, positive correlation was evident, however significance may not have been reached due to the small sample size.

The finding that speech discrimination correlates with QoL somewhat agrees with the conclusion that other factors, rather than just the degree of HI itself, are involved in the effects of the HI. Pure tone audiometry can only provide so much information, and the experience of the HI needs to be measured in other ways. By employing measures of speech discrimination, such as word recognition in quiet and speech in noise, audiologists can obtain a more realistic view of how their patients experience their HI in their daily life. If hearing impaired individuals struggle with hearing in quiet or in noise, their QoL is likely to be reduced, as this will impact upon their ability to communicate with others in their environment.

4.6.4 Relationship between audiometric variables and hearing aid adoption

As expected, a significant difference was found between hearing aid adopters and non-adopters in terms of their BEPTA and SNR loss. WRS, on the other hand, was not significantly different between the two groups. The result that BEPTA is higher in those who adopt hearing aids supports previous research which has found that hearing aid adoption is related to degree of HI (Fischer et al., 2011). Alternatively, Garstecki and Erler (1998) found a significant difference in level of HI between *female* adopters and non-adopters only. Recall that level of HI is not the only factor implicated in hearing aid adoption with others variables such as self-perceived hearing handicap (Fischer et al., 2011; Garstecki & Erler, 1998; Gopinath et al., 2011; Helvik, Jacobsen, Wennberg, et al., 2006; Hogan et al., 2001), increased activity limitation and participation restrictions (Helvik, Jacobsen, Wennberg, et al., 2006), and less social support (Cox et al., 2005) also involved. The relationships between hearing aid adoption and the variables of quality of life, age, and gender will be discussed below.

The finding that SNR loss is higher in those who choose to adopt hearing aids supports the findings of Robertson and colleagues (2012), indicating that those who have more difficulty understanding speech in the presence of background noise are more likely to adopt hearing aids. Also in support of the Robertson et al. (2012) study was the finding that WRS did not significantly differentiate hearing aid adopters from non-adopters. Robertson et al. (2012) reported that ceiling effects may have resulted in the lack of difference, with individuals in their sample exhibiting good scores for speech discrimination in quiet. This may well be the case for this study, given that participant scores were in the range of 84% to 92% correct. Thus, with such a restricted range of scores, being able to differentiate between groups is unlikely.

4.6.5 Relationship between quality of life and demographic variables

In the present study, a relationship between QoL and age was not found. Few studies have reported on demographic variables when investigating the use of the HHI with HI individuals. Gordon-Salant, Lantz, and Fitzgibbons (1994) found that younger adults, aged between 18 and 40, reported greater hearing handicap than older adults aged 65 to 75. On the other hand, Chang and colleagues (2009) reported an increase in hearing handicap as age increased over the age of 70. Of note is that the age group of 65 to 69 year olds reported more hearing handicap than those in the 70 to 74 year age group. This trend was not evident following adjustment for degree of HI and other variables, however. As the methodologies of the two studies mentioned are different, it is difficult to compare them; while Gordon-Salant and colleagues (1994) used wide age groups at different ends of the spectrum, Chang et al. (2009) employed narrower age bands above the age of 65. Correlational analysis was employed in this study to look at the entire age range, thus comparison cannot be made here either. A possible explanation for not achieving a significant result is the small sample size which restricted the level of variability in age range. With a larger sample size and age range, comparison of age groups could be conducted. Evidently, further research is warranted in order to determine if indeed there are effects of age on the HHI score.

The results of this study found that HHI score was not significantly different between the genders. This is in agreement with findings by Chang et al. (2009) who reported that gender was not associated with self-perceived hearing handicap, and also the recent study by Kelly-Campbell and Atcherson (2012). This is interesting considering the finding mentioned earlier that men are more likely to exhibit HI, with the HI likely to be greater than that of women. Garstecki and Erler (1999) reported that older men, aged between 65 and 93, have a greater acceptance of their HI, are less angry, feel less responsible for solving communication problems on their own, and use maladaptive communication behaviours less often. These are

possible reasons as to why men experience less handicap even though their HI may be greater than that of women; they are more comfortable with their HI in communication situations. It is possible that this may be true only for those who are retired, however, and thus experience fewer dynamic listening situations. Another possibility is that men are less willing to disclose problems or negative feelings resulting from their HI (Garstecki & Erler, 1999). This corresponds to the theories behind anxiety differences between genders. As mentioned earlier, it is generally more acceptable for women to admit to feelings of fear and anxiety, whereas men, who are seen to be more independent, are less willing to talk of such feelings (Bekker & van Mens-Verhulst, 2007; McLean & Anderson, 2009).

4.6.6 Relationship between quality of life and hearing aid adoption

Also in support of the literature was the finding that hearing aid adopters exhibited reduced QoL as indicated by their score on the HHI. Several studies have reported that hearing aid adopters exhibit higher scores on the HHIE, and thus poorer QoL, when compared to non-adopters (Chang et al., 2009; Fischer et al., 2011; Gopinath et al., 2011; Humes, et al., 2003). However, much like hearing handicap, the adoption of hearing aids by an individual is based not only on level of HI, but other factors such as self-perceived hearing handicap (Fischer et al., 2011; Garstecki & Erler, 1998; Gopinath et al., 2011; Helvik, Jacobsen, Wennberg, et al., 2006; Hogan et al., 2001), increased activity limitation and participation restrictions (Helvik, Jacobsen, Wennberg, et al., 2006), and less social support (Cox et al., 2005). The effects of age and gender on hearing aid adoption are less clear.

4.6.7 Relationship between hearing aid adoption and demographic variables

The results of this study showed no significant difference between hearing aid adopters and non-adopters in terms of their age. This is in contrast to previous research which suggested age was indeed related to hearing aid adoption. Helvik, Jacobsen, Wennberg et al.

(2006) found that age was a factor in previous hearing aid use, while others have reported that use of hearing aids increases with age (Hogan et al., 2001; Kochkin, 2007). Gopinath et al. (2011) reported the greatest incidence of hearing aid usage in those aged 80 to 99 years; as age increased so too did hearing aid usage. In their recent study, Robertson and colleagues (2012) suggested little variation in age may have led to their finding that adopters and non-adopters did not differ in terms of age. This may be the case for the present study, which employed a small number of participants with the relatively narrow age range of 52 to 71 years.

The present study also found that hearing aid adopters did not differ significantly from non-adopters in terms of gender, however with a Cohen's d effect size of .55, the area certainly warrants further investigation. As explained above, effect size represents the magnitude of the result (Lipsey, 1990). This inconclusive result suggests that a larger sample size, which would increase statistical power, may produce a significant result.

The literature relating to hearing aid adoption and gender is mixed. While the result of the present study is in agreement with both Gopinath and colleagues (2011), who found the incidence of hearing aid usage to be similar for men and women, and Robertson et al. (2012), who reported adopters did not differ from non-adopters in terms of gender, gender differences have been reported by other researchers. Helvik, Jacobsen, Wennberg et al. (2006) found that previous hearing aid use was more common in women than men, in contrast to the finding that men are more likely than women to use a hearing aid (Hogan et al., 2001). These conflicting findings suggest that it is still unclear as to whether gender impacts upon hearing aid adoption, with further investigation needed to clarify this situation.

4.7 Clinical Implications

One of the primary reasons for this study was to add to the small amount of research on cognitive anxiety and, in particular, the use of the CAS with hearing impaired individuals. In doing so, clinical uses regarding cognitive anxiety have become apparent. Firstly, as mentioned by Kelly and colleagues (2011), an audiologist can use knowledge of cognitive anxiety to identify how ready a client is for amplification or other rehabilitation strategies. As the results of their study, and the present study, identified cognitive anxiety as a potential factor in the decision to seek services and adopt hearing aids, it could be helpful to listen for signs of cognitive anxiety (see Appendix E for examples), particularly when the individual has been referred for the appointment. In this situation, the individual may not be ready for rehabilitation, but may feel pressured to consult an audiologist. By recognising the individual's level of cognitive anxiety, an audiologist may be able to provide assistance better suited to that person, resulting in greater adherence and satisfaction (Kelly et al., 2011).

If it is apparent that the client is not yet ready for rehabilitation, as seen in a lack of cognitive anxiety, the audiologist can attempt to raise the level of cognitive anxiety by increasing awareness of the individual's HI; in particular, any difficulties the client may experience in communication settings. By exploring these situations, and employing speech testing, specifically speech in noise testing, the audiologist may find that the client's level of cognitive anxiety increases, with the difficulties faced when communicating becoming more apparent. This process could be enhanced by the inclusion of the significant other, especially if the significant other was the one who referred the hearing impaired adult to the audiologist. The presence of the significant other may help to raise the level of cognitive anxiety by identifying communication situations where the hearing impaired individual had misunderstood something that was said, thus resulting in a communication breakdown. This may be enough to encourage the individual to realise they are in need of assistance.

As mentioned above, speech in noise testing could be a useful tool in the initiation of the rehabilitation process. Both this study and the Robertson et al. (2012) study found that hearing aid adopters differed significantly from non-adopters in terms of their speech in noise results. These results provide strong support for the use of speech in noise testing during an initial audiological appointment. Firstly, it could be used as a counselling tool for clients who do not realise they are missing a lot of speech in the presence of background noise, raising awareness of the complexity of their HI. The inclusion of speech testing as part of the audiological test battery also makes the process more applicable to the real world for the client. While listening for tones in a quiet situation is not generally a part of everyday life, listening to someone speaking in a noisy environment may be. Lastly, speech in noise testing can provide the audiologist with information as to whether the client may want to adopt hearing aids. With completion of the speech in noise test and the addition of listening for signs of cognitive anxiety, the audiologist should have a good idea of whether a client is ready for rehabilitation or if more time is needed to accept and adjust to the HI.

Finally, by also listening for signs of cognitive anxiety *following* rehabilitation, the audiologist can gauge the benefit of the intervention, hopefully seeing a reduction in cognitive anxiety. A decrease in cognitive anxiety following treatment would occur if the client is experiencing fewer communication problems, and thus is able to anticipate and meaningfully integrate events. Because breakdowns in communication are occurring less often due to the rehabilitation, the individual experiences less cognitive anxiety and this would be evident to the audiologist with fewer signs of cognitive anxiety being expressed in the client's speech.

4.8 Limitations and Directions for Future Research

Mentioned above several times is the limitation of a small sample size in producing statistically significant correlations and between-group differences. By increasing the sample size while also increasing the range of ages, between group differences could be tested for by dividing the sample into ‘younger’ and ‘older’ participants. Also, because of the non-normal distributions identified within the groups, non-parametric tests were employed, reducing the amount of statistical power. This was evident for the hearing aid adoption groups also. With the addition of more participants, the balance between adopters and non-adopters could be more even, allowing for better statistical comparisons and greater statistical power. Given the time constraints inherent in a master’s thesis, and the difficulty of finding participants who are consulting for the first time, the sample size of this study was small. Future research can overcome this limitation by recruiting more participants over a longer period of time.

Another limitation of the present study is the inability to generalise the results to the larger population of hearing impaired adults. Only one audiology clinic was involved in the data collection. The results, therefore, cannot be assumed to apply to the general population of hearing impaired adults. Future studies could involve multiple clinics, allowing the results to apply to the general population of hearing impaired adults, while also increasing the ability to recruit more participants.

Finally, causal relationships could not be determined in this study. The present study was a descriptive study, rather than a true experimental study. As mentioned earlier, with regard to the significant difference in cognitive anxiety levels between adopters and non-adopters, it is not possible to determine if people adopt hearing aids because they are experiencing high levels of cognitive anxiety, or if the decision to adopt hearing aids causes cognitive anxiety. Future research could investigate these possibilities, while also examining

the possibility of mediator or moderator variables in the relationships identified between cognitive anxiety and the study variables.

4.9 Conclusion

Cognitive anxiety is a state anxiety, experienced by people when they are unable to, or only partially able to, meaningfully interpret and therefore judge the implications of an event (Viney & Westbrook, 1976). The present study examined the presence of cognitive anxiety in a sample of hearing impaired adults who were consulting an audiologist for the first time. The level of cognitive anxiety, measured using the CAS, was investigated for relationships with age, audiometric variables, and QoL, and also compared between genders and hearing aid adopters and non-adopters. Cognitive anxiety level was found to be significantly related to an ability to understand speech in noise, as measured with the QuickSIN, and QoL, as measured using the HHI. It was also found to be significantly different between hearing aid adopters and non-adopters. These results, and other ‘inconclusive’ results, suggest further investigation is warranted. By identifying whether cognitive anxiety is a motivating factor in the decision to seek services and adopt hearing aids, clinicians can employ their knowledge of cognitive anxiety to help determine if a client is ready for rehabilitation. By using cognitive anxiety as a cue, the audiologist can suggest a treatment appropriate for the client, increasing efficiency of the appointment, while also potentially enhancing the experience for the client. Furthermore, the audiologist can encourage initiation of the rehabilitation process by exploring the effects of HI on communication situations, employing speech in noise testing, and including the significant other in the process.

References

- Agrawal, Y., Platz, E. A., & Niparko, J. K. (2008). Prevalence of hearing loss and differences by demographic characteristics among US adults. *Archives of Internal Medicine*, 168(14), 1522–1530.
- Aiello, C. P., de Lima, I. I., & Ferrari, D. V. (2011). Validity and reliability of the hearing handicap inventory for adults. *Brazilian Journal of Otorhinolaryngology*, 77(4), 432–438.
- Andersson, G., & Green, M. (1995). Anxiety in elderly hearing impaired persons. *Perceptual and Motor Skills*, 81, 552–554.
- Andersson, G., & Hagnebo, C. (2003). Hearing impairment, coping strategies, and anxiety sensitivity. *Journal of Clinical Psychology in Medical Settings*, 10(1), 35–39.
- Bagai, A., Thavendiranathan, P., & Detsky, A. S. (2006). Does this patient have hearing impairment? *Journal of the American Medical Association*, 295(4), 416–428.
- Baltes, P. B., & Lindenberger, U. (1997). Emergence of a powerful connection between sensory and cognitive Functions across the adult life span: a new window to the study of cognitive aging? *Psychology and Aging*, 12(1), 12–21.
- Bannister, D. (2003). The logic of passion. In F. Fransella (Ed.), *International handbook of personal construct psychology* (pp. 61–74). West Sussex, UK: John Wiley & Sons, Ltd.
- Beekman, A. T. F., Bremmer, M. A., Deeg, D. J. H., van Balkon, A. J. L. M., Smit, J. H., De Beurs, E., ... van Tilburg, W. (1998). Anxiety disorders in later life: A report from the Longitudinal Aging Study Amsterdam. *International Journal of Geriatric Psychiatry*, 13, 717–726.
- Bekker, M. H. J., & van Mens-Verhulst, J. (2007). Anxiety disorders: Sex differences in prevalence, degree, and background, but gender-neutral treatment. *Gender Medicine*, 4(Suppl. B), S178–93.
- Bess, F. H. (2000). The role of generic health-related quality of life measures in establishing audiological rehabilitation outcomes. *Ear and Hearing*, 21(4 Suppl.), 74S–79S.
- Brenes, G. A. (2006). Age differences in the presentation of anxiety. *Aging & Mental Health*, 10(3), 298–302. doi:10.1080/13607860500409898
- Brenes, G. A. (2007). Anxiety, depression, and quality of life in primary care patients. *Primary Care Companion to the Journal of Clinical Psychiatry*, 9(6), 437–443.
- Bucky, S. F., Spielberger, C. D., & Bale, R. M. (1972). Effects of instructions on measures of state and trait anxiety in flight students. *The Journal of Applied Psychology*, 56(3), 275–276.

- Bunn, T. A., & Clarke, A. M. (1979). Crisis intervention: An experimental study of the effects of a brief period of counselling on the anxiety of relatives of seriously injured or ill hospital patients. *British Journal of Medical Psychology*, 52, 191–195.
- Butt, T., & Burr, V. (2004). *Invitation to Personal Construct Psychology* (2nd ed.). Philadelphia: Whurr Publishers.
- Cacciatore, F., Napoli, C., Abete, P., Marciano, E., Triassi, M., & Rengo, F. (1999). Quality of life determinants and hearing function in an elderly population: Osservatorio Geriatrico Campano Study Group. *Gerontology*, 45(6), 323–328.
- Chang, H.-P., Ho, C.-Y., & Chou, P. (2009). The factors associated with a self-perceived hearing handicap in elderly people with hearing impairment - results from a community-based study. *Ear and Hearing*, 30(5), 576–583.
doi:10.1097/AUD.0b013e3181ac127a
- Chew, H. S., & Yeak, S. (2010). Quality of life in patients with untreated age-related hearing loss. *The Journal of Laryngology and Otology*, 124(8), 835–841.
doi:10.1017/S0022215110000757
- Chisolm, T. H., Johnson, C. E., Danhauer, J. L., Portz, L. J. P., Abrams, H. B., Lesner, S., ... Newman, C. W. (2007). A systematic review of health-related quality of life and hearing aids: final report of the American Academy of Audiology Task Force On the Health-Related Quality of Life Benefits of Amplification in Adults. *Journal of the American Academy of Audiology*, 18(2), 151–183.
- Cienkowski, K. M., & Pimentel, V. (2001). The hearing aid “effect” revisited in young adults. *British Journal of Audiology*, 35(5), 289–295.
- Clark, J. G. (1981). Uses and abuses of hearing loss classification. *American Speech-Language-Hearing Association*, 23, 493–500.
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.). Hillsdale, NJ: L. Erlbaum Associates.
- Cox, R. M., Alexander, G. C., & Gray, G. A. (2005). Who wants a hearing aid? Personality profiles of hearing aid seekers. *Ear and Hearing*, 26(1), 12–26.
- Cruickshanks, K. J., Wiley, T. L., Tweed, T. S., Klein, B. E. K., Klein, R., Mares-Perlman, J. A., & Nondahl, D. M. (1998). Prevalence of hearing loss in older adults in Beaver Dam, Wisconsin: The Epidemiology of Hearing Loss Study. *American Journal of Epidemiology*, 148(9), 879–886.
- Dalton, D. S., Cruickshanks, K. J., Klein, B. E. K., Klein, R., Wiley, T. L., & Nondahl, D. M. (2003). The impact of hearing loss on quality of life in older adults. *The Gerontologist*, 43(5), 661–668.
- Davis, A., Smith, P., Ferguson, M., Stephens, D., & Gianopoulos, I. (2007). Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models. *Health Technology Assessment*, 11(42), 1-294.

- De Beurs, E., Beekman, A. T., Deeg, D. J., van Dyck, R., & van Tilburg, W. (2000). Predictors of change in anxiety symptoms of older persons: Results from the Longitudinal Aging Study Amsterdam. *Psychological Medicine*, 30(3), 515–527.
- Demorest, M., Wark, D., & Erdman, S. (2011). Development of the Screening Test for Hearing Problems. *American Journal of Audiology*, 20, 100–110. doi:10.1044/1059-0889(2011/10-0048)b
- Derogatis, L. R., Rickels, K., & Rock, A. F. (1976). The SCL-90 and the MMPI: a step in the validation of a new self-report scale. *British Journal of Psychiatry*, 128, 280–289.
- DiLollo, A., Manning, W. H., & Neimeyer, R. A. (2003). Cognitive anxiety as a function of speaker role for fluent speakers and persons who stutter. *Journal of Fluency Disorders*, 28, 167–186. doi:10.1016/S0094-730X(03)00043-3
- Duijvestijn, J. A., Anteunis, L. J. C., Hoek, C. J., van den Brink, R. H. S., Chenault, M. N., & Manni, J. J. (2003). Help-seeking behaviour of hearing-impaired persons aged ≥ 55 years: Effect of complaints, significant others and hearing aid image. *Acta Oto-Laryngologica*, 123(7), 846–850. doi:10.1080/0001648031000719
- Dupuy, H. J. (1984). The Psychological General Well-Being (PGWB) index. In N. K. Wenger, M. E. Mattson, C. D. Furberg, & J. Elinson (Eds.), *Assessment of quality of life in clinical trials of cardiovascular therapies* (pp. 170–183). Washington, DC: Le Jacq Publishing.
- Erdman, S. A., & Demorest, M. E. (1998a). Adjustment to hearing impairment I: Description of a heterogeneous clinical population. *Journal of Speech, Language, and Hearing Research*, 41(1), 107–122.
- Erdman, S. A., & Demorest, M. E. (1998b). Adjustment to hearing impairment II: Audiological and demographic correlates. *Journal of Speech, Language, and Hearing Research*, 41(1), 123–136.
- Eriksson-Mangold, M., & Carlsson, S. G. (1991). Psychological and somatic distress in relation to perceived hearing disability, hearing handicap, and hearing measurements. *Journal of Psychosomatic Research*, 35(6), 729–740.
- Espmark, A. K., & Scherman, M. H. (2003). Hearing confirms existence and identity – experiences from persons with presbycusis. *International Journal of Audiology*, 42, 106–115.
- Etymotic Research. (1993). The SIN Test [Computer software]. Elk Grove Village, IL: Etymotic Research.
- Etymotic Research. (2001). QuickSIN Speech in Noise Test (Version 1.3) [Computer software]. Elk Grove Village, IL: Etymotic Research.
- Fischer, M. E., Cruickshanks, K. J., Wiley, T. L., Klein, B. E. K., Klein, R., & Tweed, T. S. (2011). Determinants of hearing aid acquisition in older adults. *American Journal of Public Health*, 101(8), 1449–1455. doi:10.2105/AJPH.2010.300078

- Flint, A. J. (2005). Anxiety and its disorders in late life: Moving the field forward. *The American Journal of Geriatric Psychiatry*, 13(1), 3–6. doi:10.1176/appi.ajgp.13.1.3
- Fuentes, K., & Cox, B. (2000). Assessment of anxiety in older adults: A community-based survey and comparison with younger adults. *Behaviour Research and Therapy*, 38(3), 297–309.
- Fuentes, K., & Cox, B. J. (1997). Prevalence of anxiety disorders in elderly adults: A critical analysis. *Journal of Behavior Therapy and Experimental Psychiatry*, 28(4), 269–279. doi:10.1016/S0005-7916(97)00025-6
- Garstecki, D. C., & Erler, S. F. (1998). Hearing loss, control, and demographic factors influencing hearing aid use among older adults. *Journal of Speech, Language, and Hearing Research*, 41(3), 527–537.
- Garstecki, D. C., & Erler, S. F. (1999). Older adult performance on the Communication Profile for the Hearing Impaired: gender difference. *Journal of Speech, Language, and Hearing Research*, 42(4), 785–796.
- Gatehouse, S. (2001). Self-report outcome measures for adult hearing aid services: Some uses, users, and options. *Trends in Amplification*, 5(3), 91–110. doi:10.1177/108471380100500302
- Gates, G. A., Cooper, J. C., Kannel, W. B., & Miller, N. J. (1990). Hearing in the elderly: The Framingham Cohort, 1983–1985. *Behavioral Techniques in Audiology and Otology*, 11(4), 247–256.
- Gomez, R. G., & Madey, S. F. (2001). Coping-with-hearing-loss model for older adults. *The Journals of Gerontology*, 56B(4), P223–P225.
- Gopinath, B., Schneider, J., Hartley, D., Teber, E., McMahon, C. M., Leeder, S. R., & Mitchell, P. (2011). Incidence and predictors of hearing aid use and ownership among older adults with hearing loss. *Annals of Epidemiology*, 21(7), 497–506. doi:10.1016/j.annepidem.2011.03.005
- Gopinath, B., Schneider, J., McMahon, C. M., Teber, E., Leeder, S. R., & Mitchell, P. (2012). Severity of age-related hearing loss is associated with impaired activities of daily living. *Age and Ageing*, 41(2), 195–200. doi:10.1093/ageing/afr155
- Gordon-Salant, S., Lantz, J., & Fitzgibbons, P. (1994). Age effects on measures of hearing disability. *Ear and Hearing*, 15(3), 262–265.
- Gottschalk, L. A., & Gleser, G. C. (1969). *The measurement of psychological states through the content analysis of verbal behavior*. Berkeley, Los Angeles: University of California Press.
- Greville, A. (2005). Hearing impaired and deaf people in New Zealand: an update on population numbers and characteristics. *Greville Consulting report*, March 2005.
- Gum, A. M., King-Kallimanis, B., & Kohn, R. (2009). Prevalence of mood, anxiety, and substance-abuse disorders for older Americans in the national comorbidity survey-replication. *American Journal of Geriatric Psychiatry*, 17(9), 769–781.

- Gussekloo, J., de Bont, L. E., von Faber, M., Eekhof, J. A., de Laat, J. A., Hulshof, J. H., ...Westendorp, R. G. J. (2003). Auditory rehabilitation of older people from the general population - the Leiden 85-plus study. *The British Journal of General Practice*, 53(492), 536–540.
- Hallberg, L. R.-M. (1999). Hearing impairment, coping, and consequences on family life. *Journal of the Academy of Rehabilitative Audiology*, 32, 45–59.
- Hallberg, L. R.-M., Hallberg, U., & Kramer, S. E. (2008). Self-reported hearing difficulties, communication strategies and psychological general well-being (quality of life) in patients with acquired hearing impairment. *Disability and Rehabilitation*, 30(3), 203–212. doi:10.1080/09638280701228073
- Helvik, A., Jacobsen, G., & Hallberg, L. R.-M. (2006a). Psychological well-being of adults with acquired hearing impairment. *Disability and Rehabilitation*, 28(9), 535–545. doi:10.1080/09638280500215891
- Helvik, A., Jacobsen, G. W., & Hallberg, L. R.-M. (2006b). Effects of impaired hearing on perceived health and life situation. *Scandinavian Journal of Disability Research*, 8(4), 263–277.
- Helvik, A., Jacobsen, G., Wennberg, S., Arnesen, H., Ringdahl, A., & Hallberg, L. R.-M. (2006). Activity limitation and participation restriction in adults seeking hearing aid fitting and rehabilitation. *Disability and Rehabilitation*, 28(5), 281–288. doi:10.1080/09638280500160311
- Helvik, A., Wennberg, S., Jacobsen, G., & Hallberg, L. R.-M. (2008). Why do some individuals with objectively verified hearing loss reject hearing aids? *Audiological Medicine*, 6(2), 141–148. doi:10.1080/16513860802178692
- Hickson, L., Allen, J., Beswick, R., Fulton, M., Wolf, D., Worrall, L., & Scarinci, N. (2008). Relationships between hearing disability, quality of life and wellbeing in older community-based Australians. *Australian and New Zealand Journal of Audiology*, 30(2), 99–112. doi:10.1375/audi.30.2.99
- Hickson, L., Worrall, L., & Scarinci, N. (2007). A randomized controlled trial evaluating the active communication education program for older people with hearing impairment. *Ear and Hearing*, 28(2), 212–230. doi:10.1097/AUD.0b013e31803126c8
- Hogan, A., Taylor, A., Doyle, J., Osborn, R., Fitzmaurice, K., & Kendig, H. A. L. (2001). The communication and health needs of older people with hearing loss: Are hearing aids enough? *The Australian and New Zealand Journal of Audiology*, 23(1), 10–17.
- Humes, L. E., Wilson, D. L., & Humes, A. C. (2003). Examination of differences between successful and unsuccessful elderly hearing aid candidates matched for age, hearing loss and gender. *International Journal of Audiology*, 42(7), 432–441.
- Institute of Electrical and Electronics Engineers. (1969). IEEE recommended practice for speech quality measurements. *IEEE Transactions on Audio and Electroacoustics*, 17, 227–246.

- Jennings, M. B., & Shaw, L. (2008). Impact of hearing loss in the workplace: raising questions about partnerships with professionals. *Work*, 30(3), 289–295.
- Jones, D. A., Victor, C. R., & Vetter, N. J. (1984). Hearing difficulty and its psychological implications for the elderly. *Journal of Epidemiology and Community Health*, 38(1), 75–78.
- Jorm, A. F. (2000). Does old age reduce the risk of anxiety and depression? A review of epidemiological studies across the adult life span. *Psychological Medicine*, 30(1), 11–22.
- Kelly, G. A. (1955). *The psychology of personal constructs*. New York: Norton.
- Kelly, R. J., & Atcherson, S. R. (2011). Quality of life for individuals with hearing impairment who have not consulted for services and their significant others: Same- and different-sex couples. *Journal of Communication Disorders*, 44(3), 336–344. doi:10.1016/j.jcomdis.2011.01.004
- Kelly, R. J., Neimeyer, R. A., & Wark, D. J. (2011). Cognitive anxiety and the decision to seek services for hearing problems. *Journal of Constructivist Psychology*, 24(2), 168–179.
- Kelly-Campbell, R. J., & Atcherson, S. R. (2012). Perception of quality of life for adults with hearing impairment in the LGBT community. *Journal of Communication Disorders*, 45(5), 367–377. doi:10.1016/j.jcomdis.2012.05.002
- Kent, B., & La Grow, S. (2007). The role of hope in adjustment to acquired hearing loss. *International Journal of Audiology*, 46(6), 328–340. doi:10.1080/14992020701261389
- Killion, M. C., & Niquette, P. A. (2000). What can the pure-tone audiogram tell us about a patient's SNR loss? *Hearing Journal*, 53, 46–53.
- Killion, M. C., Niquette, P. A., Gudmundsen, G. I., Revit, L. J., & Banerjee, S. (2004). Development of a quick speech-in-noise test for measuring signal-to-noise ratio loss in normal-hearing and hearing-impaired listeners. *The Journal of the Acoustical Society of America*, 116(4), 2395–2405. doi:10.1121/1.1784440
- Killion, M. C., & Vilchur, E. (1993). Kessler was right-partly: But SIN test shows some aids improve hearing in noise. *Hearing Journal*, 46, 31–35.
- Kochkin, S. (2007). MarkeTrak VII: Obstacles to adult non-user adoption of hearing aids. *The Hearing Journal*, 60(4), 24–51.
- Kochkin, S. (2009). MarkeTrak VIII: 25-year trends in the hearing health market. *Hearing Review*, 16(11), 12–31.
- Kochkin, S. (2011). MarkeTrak VIII: Patients report improved quality of life with hearing aid usage. *The Hearing Journal*, 64(6), 25–32.
- Kochkin, S. (2012). MarkeTrak VIII: The key influencing factors in hearing aid purchase intent. *Hearing Review*, 19(3), 12–25.

- Kochkin, S., & Rogin, C. M. (2000). Quantifying the obvious: The impact of hearing instruments on quality of life. *The Hearing Review*, 7(1), 6–34.
- Lenze, E. J., & Loebach Wetherell, J. (2011). A lifespan view of anxiety disorders. *Dialogues in Clinical Neuroscience*, 13(4), 381–399.
- Lindenberger, U., & Baltes, P. B. (1994). Sensory functioning and intelligence in old age: A strong connection. *Psychology and Aging*, 9(3), 339–355.
- Lindenberger, U., & Baltes, P. B. (1997). Intellectual functioning in old and very old age: Cross-sectional results from the Berlin Aging Study. *Psychology and Aging*, 12(3), 410–432.
- Lipsey, M. W. (1990). *Design sensitivity: Statistical power for experimental research*. Newbury Park, CA: Sage Publications.
- Lotfi, Y., Mehrkian, S., Moossavi, A., & Faghieh-Zadeh, S. (2009). Quality of life improvement in hearing-impaired elderly people after wearing a hearing aid. *Archives of Iranian Medicine*, 12(4), 365–370.
- McLean, C. P., & Anderson, E. R. (2009). Brave men and timid women? A review of the gender differences in fear and anxiety. *Clinical Psychology Review*, 29(6), 496–505. doi:10.1016/j.cpr.2009.05.003
- McLean, C. P., Asnaani, A., Litz, B. T., & Hofmann, S. G. (2011). Gender differences in anxiety disorders: Prevalence, course of illness, comorbidity and burden of illness. *Journal of Psychiatric Research*, 45(8), 1027–1035. doi:10.1016/j.jpsychires.2011.03.006
- Mehta, K. M., Simonsick, E. M., Penninx, B. W. J. H., Schulz, R., Rubin, S. M., Satterfield, S., & Yaffe, K. (2003). Prevalence and correlates of anxiety symptoms in well-functioning older adults: Findings from the health aging and body composition study. *Journal of the American Geriatrics Society*, 51(4), 499–504.
- Menegotto, I., & Soldara, C. L. C., Anderle, P., & Anhaia, T. C. (2011). Correlation between hearing loss and the results of the following questionnaires: Hearing Handicap Inventory for the Adults-Screening Version HHIA-S and Hearing Handicap Inventory for the Elderly-Screening. *International Archives of Otolaryngology*, 15(3), 319–326.
- Mogotsi, M., Kaminer, D., & Stein, D. J. (2000). Quality of life in the anxiety disorders. *Harvard Review of Psychiatry*, 8(6), 273–282.
- Mulrow, C. D., Tuley, M. R., & Aguilar, C. (1992). Sustained benefits of hearing aids. *Journal of Speech and Hearing Research*, 35(6), 1402–1405.
- Nachtegaal, J., Smit, J. H., Smits, C., Bezemer, P. D., van Beek, J. H. M., Festen, J. M., & Kramer, S. E. (2009). The association between hearing status and psychosocial health before the age of 70 years: Results from an internet-based national survey on hearing. *Ear and Hearing*, 30(3), 302–312. doi:10.1097/AUD.0b013e31819c6e01

- Newman, C. W., Weinstein, B. E., Jacobson, G. P., & Hug, G. A. (1990). The Hearing Handicap Inventory for Adults: Psychometric adequacy and audiometric correlates. *Ear and Hearing, 11*(6), 430–433.
- Newman, C. W., Weinstein, B. E., Jacobson, G. P., & Hug, G. A. (1991). Test-retest reliability of the hearing handicap inventory for adults. *Ear and Hearing, 12*(5), 355–357.
- Nondahl, D. M., Cruickshanks, K. J., Wiley, T. L., Tweed, T. S., Klein, R., & Klein, B. E. (1998). Accuracy of self-reported hearing loss. *Audiology, 37*(5), 295–301.
- Öberg, M., Lunner, T., & Andersson, G. (2007). Psychometric evaluation of hearing specific self-report measures and their associations with psychosocial and demographic variables. *Audiological Medicine, 5*(3), 188–199. doi:10.1080/16513860701560214
- Öberg, M., Marcusson, J., Nägga, K., & Wressle, E. (2012). Hearing difficulties, uptake, and outcomes of hearing aids in people 85 years of age. *International Journal of Audiology, 51*(2), 108–115. doi:10.3109/14992027.2011.622301
- Palmer, B. W., Jeste, D. V., & Sheikh, J. I. (1997). Anxiety disorders in the elderly: DSM-IV and other barriers to diagnosis and treatment. *Journal of Affective Disorders, 46*(3), 183–190.
- Palmer, C. V., Solodar, H. S., Hurley, W. R., Byrne, D. C., & Williams, K. O. (2009). Self-perception of hearing ability as a strong predictor of hearing aid purchase. *Journal of the American Academy of Audiology, 20*(6), 341–347. doi:10.3766/jaaa.20.6.2
- Pearson, J. D., Morrell, C. H., Gordon-Salant, S., Brant, L. J., Metter, E. J., Klein, L. L., & Fozard, J. L. (1995). Gender differences in a longitudinal study of age-associated hearing loss. *The Journal of the Acoustical Society of America, 97*(2), 1196–1205.
- Rapaport, M. H., Clary, C., Fayyad, R., & Endicott, J. (2005). Quality-of-life impairment in depressive and anxiety disorders. *The American Journal of Psychiatry, 162*(6), 1171–1178. doi:10.1176/appi.ajp.162.6.1171
- Robertson, M., Kelly-Campbell, R., & Wark, D. (2012). Use of audiometric variables to differentiate groups of adults based on hearing aid ownership and use. *Contemporary Issues in Communication Science and Disorders, 39*, 114–120.
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*(6), 1069–1081. doi:10.1037/0022-3514.57.6.1069
- Sataloff, R. T., Sataloff, J., Virag, T. M., Sokolow, C. J., & Luckhurst, J. (2006). Hearing loss: Handicap and rehabilitation. In R. T. Sataloff & J. Sataloff (Eds.), *Occupational Hearing Loss* (3rd ed., pp. 441–462). Boca Raton, FL: CRC Press.
- Saunders, G., & Cienkowski, K. (1996). Refinement and psychometric evaluation of the attitudes toward loss of hearing questionnaire. *Ear and Hearing, 17*, 505–519.
- Seniors Research Group. (1999). *The consequences of untreated hearing loss in older persons*. Washington, DC: The National Council on the Aging.

- Stark, P., & Hickson, L. (2004). Outcomes of hearing aid fitting for older people with hearing impairment and their significant others. *International Journal of Audiology*, 43, 390–398.
- Stephens, D., & Héту, R. (1991). Impairment, disability and handicap in audiology: Towards a consensus. *Audiology*, 30, 185–200.
- Strine, T. W., Chapman, D. P., Kobau, R., & Balluz, L. (2005). Associations of self-reported anxiety symptoms with health-related quality of life and health behaviors. *Social Psychiatry and Psychiatric Epidemiology*, 40(6), 432–8. doi:10.1007/s00127-005-0914-1
- Swan, I. R. C., & Gatehouse, S. (1990). Factors influencing consultation for management of hearing disability. *British Journal of Audiology*, 24, 155–160.
- Tambs, K. (2004). Moderate effects of hearing loss on mental health and subjective well-being: Results from the Nord-Trøndelag Hearing Loss Study. *Psychosomatic Medicine*, 66(5), 776–82. doi:10.1097/01.psy.0000133328.03596.fb
- Tillman, T. W., & Carhart, R. (1966). *An expanded test for speech discrimination utilizing CNC monosyllabic words*: Northwestern University Auditory Test No. 6. Brooks Air Force Base, TX: USAF School of Aerospace Medicine.
- Tillman, T. W., & Olsen, W. O. (1973). Speech audiometry. In J. Jerger (Ed.), *Modern developments in audiology* (pp. 37-74). New York, NY: Academic Press.
- Valente, M., & van Vliet, D. (1997). The independent hearing aid fitting forum (IHAF) protocol. *Trends in Amplification*, 2, 6–35.
- Ventry, I. M., & Weinstein, B. E. (1982). The Hearing Handicap Inventory for the elderly: A new tool. *Ear and Hearing*, 3(3), 128–134.
- Ventry, I. M., & Weinstein, B. E. (1983). Identification of elderly people with hearing problems. *American Speech-Language-Hearing Association*, 25(7), 37–42.
- Viney, L. L. (1980). *Transitions*. Sydney, Australia: Cassell.
- Viney, L. L., & Westbrook, M. T. (1976). Cognitive anxiety: A method of content analysis for verbal samples. *Journal of Personality Assessment*, 40(2), 140–150.
- Vuorialho, A., Karinen, P., & Sorri, M. (2006). Effect of hearing aids on hearing disability and quality of life in the elderly. *International Journal of Audiology*, 45(7), 400–405. doi:10.1080/14992020600625007
- Ware, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care*, 30(6), 473–483.
- Weinstein, B. E., Spitzer, J. B., & Ventry, I. M. (1986). Test-retest reliability of the Hearing Handicap Inventory for the Elderly. *Ear and Hearing*, 7(5), 295–299.
- Wells, J. E., Browne, M. A. O., Scott, K. M., McGee, M. A., Baxter, J., & Kokaua, J. (2006). Prevalence, interference with life and severity of 12 month DSM-IV disorders in Te

Rau Hinengaro: the New Zealand Mental Health Survey. *The Australian and New Zealand Journal of Psychiatry*, 40(10), 845–54. doi:10.1111/j.1440-1614.2006.01903.x

Wilson, D. H., Walsh, P. G., Sanchez, L., Davis, A. C., Taylor, A. W., Tucker, G., & Meagher, I. (1999). The epidemiology of hearing impairment in an Australian adult population. *International Journal of Epidemiology*, 28(2), 247–252.

World Health Organization. (2001). *The International Classification of Functioning, Disability and Health*. Geneva: World Health Organization.

World Health Organization. (2006). *Primary ear and hearing care training resource: Advanced level*. Geneva, Switzerland.

Appendix A – Information Sheet

University of Canterbury
Department of Communication Disorders
Private Bag 4800
Christchurch 8140
New Zealand



Information Sheet

You are invited to participate as a subject in the research project **“Relationship between cognitive anxiety level and client variables at first consultation for adults with hearing impairment”**

The aim of this project is to better understand the relationship between a temporary, state anxiety (called “cognitive anxiety”) and adjustment to hearing impairment. In psychology, anxiety has been viewed in many ways. One way of thinking about anxiety is as a *transient state* – something that people experience at various times in their lives. Looking at anxiety as a transient state allows researchers and clinicians to view anxiety as a motivating factor rather than a barrier to seeking services. This study will measure a type of state anxiety, called “cognitive anxiety,” which is drawn from Personal Construct Theory. Cognitive anxiety occurs whenever a person has difficulty making meaning of their experiences. This is likely to happen when a person begins to notice difficulty with communication.

Your involvement in this project will be to participate in a five-minute interview at the time of your hearing test appointment at the hearing aid clinic. In addition, you will be asked to fill in a short questionnaire asking about the difficulties you experience as a result of your hearing impairment. A copy of your hearing test will be provided to us by the hearing aid clinic.

You have the right to withdraw from the project at any time, including withdrawal of any information you have provided. Withdrawal from participation of this study is without penalty and will in no manner affect any ongoing or future relationships with your hearing aid clinic.

In the interview, you will be asked to talk about your experience living with hearing impairment. There is a risk of feeling distressed as you discuss your experiences. The interviews will be recorded and you will be offered an opportunity to review and, if necessary, amend the transcript after the researcher, Dianne Parry, has transcribed it.

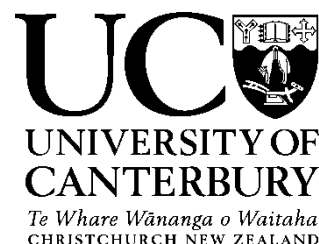
The Masters thesis is a public document and can be accessed through the University of Canterbury library. The results of the project may also be published, but you may be assured of the complete confidentiality of your data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure anonymity and confidentiality, your name will not be used on your data files; instead you will be given a participant number. In addition, the consent form will be kept in a locked cabinet in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand. Electronic data (without your identifying information) will be kept on password-protected computers that are stored in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand.

This project is being carried out as a requirement of the Master of Audiology degree at the University of Canterbury by Dianne Parry under the supervision of Dr. Rebecca Kelly-Campbell, who can be contacted on + 64 (3) 364-8327 or by email Rebecca.kelly@canterbury.ac.nz. They will be pleased to discuss any concerns you may have about participation in the project.

The project and been reviewed ***and approved*** by the University of Canterbury Human Ethics Committee.

Appendix B – Consent Form

University of Canterbury
Department of Communication Disorders
Private Bag 4800
Christchurch 8140
New Zealand



Researchers: Dianne Parry, Rebecca Kelly-Campbell

Contact address: University of Canterbury
Department of Communication Disorders
Private Bag 4800
Christchurch 8140
New Zealand

Date: 22 November 2011

Consent Form

“Relationship between cognitive anxiety level and client variables at first consultation for adults with hearing impairment”

I have read and understood the description of the above-named project. On this basis, I agree to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I provide my consent to be recorded.

I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided.

I note that the project has been reviewed **and approved** by the University of Canterbury Human Ethics Committee.

Name: (please print): _____

Signature: _____

Date: _____

Appendix C – Hearing Handicap Inventory for the Elderly

The purpose of this scale is to identify the problems your hearing loss may be causing you.

Check 'Yes', 'Sometimes', or 'No' for each question.

Do not skip any questions.

Please write N/A if the question does not apply

- | | | | |
|---|------------------------------|------------------------------------|-----------------------------|
| 1. Does a hearing problem cause you to use the phone less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2. Does a hearing problem cause you to feel embarrassed when meeting new people? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3. Does a hearing problem cause you to avoid groups of people? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 4. Does a hearing problem make you irritable? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 5. Does a hearing problem cause you to feel frustrated when talking to members of your family? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 6. Does a hearing problem cause you difficulty when attending a party? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 7. Does a hearing problem cause you to feel "stupid" or "dumb"? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 8. Do you have difficulty hearing when someone speaks in a whisper? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 9. Do you feel handicapped by a hearing problem? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 10. Does a hearing problem cause you difficulty when visiting friends, relatives, or neighbours? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 11. Does a hearing problem cause you to attend religious services less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 12. Does a hearing problem cause you to be nervous? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 13. Does a hearing problem cause you to visit friends, relatives, or neighbours less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 14. Does a hearing problem cause you to have arguments with family members? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |

- | | | | |
|---|------------------------------|------------------------------------|-----------------------------|
| 15. Does a hearing problem cause you difficulty when listening to TV or radio? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 16. Does a hearing problem cause you to go shopping less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 17. Does any problem or difficulty with your hearing upset you at all? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 18. Does a hearing problem cause you to want to be by yourself? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 19. Does a hearing problem cause you to talk to family members less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 20. Do you feel that any difficulty with your hearing limits or hampers your personal or social life? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 21. Does a hearing problem cause you difficulty when in a restaurant with relatives or friends? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 22. Does a hearing problem cause you to feel depressed? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 23. Does a hearing problem cause you to listen to TV or radio less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 24. Does a hearing problem cause you to feel uncomfortable when talking to friends? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 25. Does a hearing problem cause you to feel left out when you are with a group of people? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
-

Appendix D – Hearing Handicap Inventory for Adults

The purpose of this scale is to identify the problems your hearing loss may be causing you.

Check 'Yes', 'Sometimes', or 'No' for each question.

Do not skip any questions.

Please write N/A if the question does not apply

- | | | | |
|---|------------------------------|------------------------------------|-----------------------------|
| 1. Does a hearing problem cause you to use the phone less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2. Does a hearing problem cause you to feel embarrassed when meeting new people? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3. Does a hearing problem cause you to avoid groups of people? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 4. Does a hearing problem make you irritable? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 5. Does a hearing problem cause you to feel frustrated when talking to members of your family? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 6. Does a hearing problem cause you difficulty when attending a party? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 7. Does a hearing problem cause you difficulty hearing/understanding co-workers, clients, or customers? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 8. Do you feel handicapped by a hearing problem? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 9. Does a hearing problem cause you difficulty when visiting friends, relatives, or neighbours? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 10. Does a hearing problem cause you to feel frustrated when talking to co-workers, clients, or customers? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 11. Does a hearing problem cause you difficulty in the movies or theatre? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 12. Does a hearing problem cause you to be nervous? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 13. Does a hearing problem cause you to visit friends, relatives, or neighbours less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |

- | | | | |
|---|------------------------------|------------------------------------|-----------------------------|
| 14. Does a hearing problem cause you to have arguments with family members? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 15. Does a hearing problem cause you difficulty when listening to TV or radio? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 16. Does a hearing problem cause you to go shopping less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 17. Does any problem or difficulty with your hearing upset you at all? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 18. Does a hearing problem cause you to want to be by yourself? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 19. Does a hearing problem cause you to talk to family members less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 20. Do you feel that any difficulty with your hearing limits or hampers your personal or social life? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 21. Does a hearing problem cause you difficulty when in a restaurant with relatives or friends? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 22. Does a hearing problem cause you to feel depressed? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 23. Does a hearing problem cause you to listen to TV or radio less often than you would like? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 24. Does a hearing problem cause you to feel uncomfortable when talking to friends? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
| 25. Does a hearing problem cause you to feel left out when you are with a group of people? | Yes <input type="checkbox"/> | Sometimes <input type="checkbox"/> | No <input type="checkbox"/> |
-

Appendix E – Examples of Cognitive Anxiety

The following examples of cognitive anxiety are based upon Kelly et al.'s (2011) guidelines for scoring clauses.

Table 7
Examples of Cognitive Anxiety

Evidence of Cognitive Anxiety	Example
Difficulty in comprehension	“And I don’t understand” “So I don’t know”
Little or no experience with the topic	“People that start losing their hearing don’t realize they’re losing their hearing”
Uncertainty about topic	“I’m not sure”
Feelings of guilt or deception	“I just try to figure out what was said and how come – pass it off that way”
Denial	“I didn’t want people to know”
Speculation	“I mean I guess it works on you after a while” “I think everybody spots it pretty quickly” “So I think people just ignore it” “You figure everybody is looking at them”
Surprise that is interpreted as meaning the prediction was accurate	“And all of a sudden it’s just like uh-oh I can’t hear things anymore”