HEARING AID SATISFACTION AMONG ADULTS WITH HEARING IMPAIRMENT IN NEW ZEALAND

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Abstract

Introduction: This study investigated hearing aid (HA) satisfaction among adult with hearing impairment (HI) in New Zealand. This study aimed to answer three questions: 1) What are the current HA satisfaction levels amongst adult HA users in New Zealand? 2) How do the satisfaction findings of this study compare with other HA satisfaction data? 3) What client factors are related to HA satisfaction?

Method: Participants were recruited prospectively. They completed a questionnaire prior to HA fitting and a questionnaire three months post-fitting. Information was collected on: age, gender, HA experience, HI severity, hearing ability, change in hearing ability, hearing handicap, communication self-efficacy, change in communication self-efficacy, HA self-efficacy, HA usage, and number of appointments. HA satisfaction was measured via the Satisfaction with Amplification in Daily Life questionnaire (SADL; Cox & Alexander, 1999).

Results: Data were collected for 47 participants. Of these, 91.5% fell within or above the normative range for global satisfaction established by Cox & Alexander (1999). The mean SADL scores were predominantly high compared to previous research. Satisfaction with negative features of HAs was especially high in this study. However satisfaction with the service and cost of HAs was low compared to other research. SADL scores were found to significantly relate to age, gender, change in hearing ability, hearing handicap, communication self-efficacy, change in communication self-efficacy, and HA self-efficacy.

Conclusions: Results differed from previous research indicating that HA satisfaction may differ over time and across countries. Assessing HA satisfaction in a comprehensive standardised way, as opposed to with a single-item measure, can help identify important related factors. Targeting identified variables such as communication and HA self-efficacy may lead to improved treatment efficacy.

Table of Contents

List of Abbreviations

ANOVA	Analysis of variance
BEPTA	Better ear pure tone average
BTE	Behind-the-ear hearing aid
dB HL	Decibel hearing level
HA	Hearing aid
HAUQ	Hearing Aid User's Questionnaire
HHIE-S	Hearing Handicap Inventory for the Elderly Screening Version
HHQ	Hearing Handicap Questionnaire
HI	Hearing impairment
Hz	Hertz
ICF	International Classification of Functioning, Disability, and Health
IOI-HA	the International Outcome Inventory for Hearing Aids
ITE	In-the-ear hearing aid
MANOVA	Multivariate analysis of variance
MARS-HA	Measure of Audiologic Rehabilitation Self-Efficacy for Hearing Aids
NFD	National Foundation for the Deaf
PTA	Pure tone average
RIC	Receiver-in-the-canal
RITE	Receiver-in-the-ear hearing aid
SADL	Satisfaction with Amplification in Daily Life
SESMQ	Self-efficacy for Situational Communication Management Questionnaire
WEPTA	Worse ear pure tone average
WHO	World Health Organization

List of Tables

List of Figures

Chapter One: Introduction

1.1 Overview

Hearing Impairment (HI) is a prominent health issue in today's society with 360 million persons in the world (5.3% of the world's population) estimated to have a disabling HI (World Health Organization, 2012). In New Zealand, it has been estimated that 10% to 17% of the population live with HI (Greville, 2005; National Foundation for the Deaf, n.d.). Increased prevalence of HI can be expected in the future due to various factors. For example, as the elderly population grows and life expectancy lengthens, age-related HI (presbycusis) rates will also presumably rise.

HI impacts communication as it reduces the ability to hear and understand speech signals. This in turn has many negative consequences such as withdrawal from social activities (Arlinger, 2003), feelings of isolation, loneliness, and frustration (World Health Organization, 2014), reduced quality of life (Hickson, et al., 2008), and difficulties at work (Jennings & Shaw, 2008). Amplification via hearing aids (HAs) is a common and effective way of overcoming the deficits related to HI. HAs have been found to lead to better relationships at home and work (Kochkin, 2011). Chisolm et al. (2007) conducted a systematic review on the health-related quality of life (HR-QoL) benefits of amplification in adults. It was found that disease-specific HR-QoL measures show that HAs improve adults' HR-QoL by reducing psychological, social and emotional effects of sensorineural HI (Chisolm, et al., 2007). Despite the reported benefits of HAs, the uptake rates of devices are low among adults with HI. Only 25% of the estimated 34.35 million people with HI in the United States are thought to own HAs (Kochkin et al., 2010). It has been argued that HA satisfaction is integral to the increase of device adoption and use (Kochkin, 2010) and it is certainly in the best interest of clients to ensure that they are satisfied with their HAs.

Two New Zealand studies investigated overall HA satisfaction using a single 20-point rating scale which ranged from "very, very dissatisfied" (1) to "very, very satisfied" (20). Purdy & Jerram (1998) established a mean rating of 14.2 among 162 new and experienced users obtaining new HAs. Jerram & Purdy (2001) found a mean rating of 15.33 among 62 current HA users. These average scores convert to percentages of 71% and 77%.

HA technology has advanced rapidly over the last decade with a move from analogue to digital technology. Digital signal processing enables the use of advanced features such as noise reduction, directionality, multichannel compression, and feedback cancellation (Edwards, 2007; Kim & Barrs, 2006). Given these technological advancements, presumably HA outcomes such as satisfaction should improve. Indeed, Kaplan-Neeman, Muchnik, Hildesheimer, & Henkin (2012) investigated HA satisfaction for advanced digital HAs and found that 92% of 109 users were satisfied to some degree with their HAs. Therefore, it could be hypothesised that HA satisfaction has increased in New Zealand over the years and current rates should be investigated.

Knowledge of the factors related to HA satisfaction is clinically useful to improve client satisfaction. Numerous studies have already researched HA satisfaction variables but study methods and results are inconsistent across studies. Many of these studies use single-scale measures of satisfaction which have not been standardized. This makes it difficult to compare findings and draw strong conclusions about factors related to satisfaction. Furthermore, most research has been conducted in other countries and findings may not necessarily be applicable to the New Zealand healthcare system.

Therefore, using the Satisfaction with Amplification in Daily Life questionnaire (SADL; Cox & Alexander, 1999) as an outcome measure, this study firstly aims to determine how many HA users are satisfied with their devices. Secondly, it aims to investigate various

client factors in relation to HA satisfaction. This chapter provides information on HI and HA satisfaction and discusses previous research on HA satisfaction variables. The rationale, aims, and hypotheses of the investigation are also described.

1.2 Hearing Impairment (HI)

1.2.1 Overview

The World Health Organization (WHO, 2001) defines HI as the complete or partial loss of the ability to hear. Reduced sensitivity to auditory stimuli is the result of abnormalities (also known as lesions) in the structure and/or function of the auditory system. Pure tone audiometry is the current gold standard for measuring hearing sensitivity. It establishes the threshold of hearing typically for octave frequencies from 250 Hz to 8000 Hz. A threshold is the lowest level (in dB HL) at which a person responds to a pure tone stimulus at least 50% of the time it is presented.

HI can be classified by origin, degree and configuration. Origin refers to the site of lesion. A conductive HI is caused by a lesion to the outer or middle ear which then affects the transmission of sound to the cochlea (the hearing organ); it can often be corrected via medical or surgical management. Sensorineural HI (SNHI) is caused by damage to the inner ear structures such as the cochlea or the auditory nerve. Causes of acquired SNHI include age, noise damage, ototoxic medicines, head injuries, and vestibular Schwannomas (noncancerous tumours on the auditory nerve). While some causes of sensorineural HI can be treated (e.g. vestibular Schwannomas can be surgically removed), a SNHI is typically considered permanent. Finally, mixed HI is a combination of conductive HI and SNHI.

Degree of HI refers to its severity. Multiple classifications of hearing severity exist but a common classification system is the one by Goodman (1965) presented in Table 1. Severity can be classified according to audiometric threshold at all frequencies tested.

Configuration of HI refers to the shape of the audiogram. Possible configuration are flat, sloping, steeply sloping, corner (hearing is only present in the low frequencies), cookie-bite, rising, peaked, trough or notched (Carhart, 1945; Lloyd & Kaplan, 1978).

Degree and configuration of HI can range greatly making it difficult to compare HI across individuals. Pure Tone Averages (PTA) are the average of three or four frequency thresholds between 500 and 4000 Hz. Overall hearing severity can then be determined from the PTA again using a classification system such as that of Goodman (1965).

Table 1.1. **Degree of HI as defined by Goodman (1965).**

Degree of HI	Normal hearing	Mild	Moderate	Moderately-severe	Severe	Profound
dB HL	< 26	26-40	41-55	56-70	71-90	>91

1.2.2 Prevalence of HI

Estimations of HI prevalence can depend on numerous factors, such as subjective versus objective measurements, age of the population measured, and degree and definition of HI. Hence there is variation in reported prevalence across literature. The World Health Organization (2012) reports 360 million persons in the world have a HI and 328 million adults are affected by a disabling HI (183 million males and 145 million females). Prevalence increases with age. Agrawal, Platz, & Niparko (2008) investigated prevalence of HI in the US among a sample of 5742 adults aged 20 to 69 using objective audiometric measures. High frequency HI, defined as a PTA of 25 dB HL or higher at 3000, 4000, and 6000 Hz, increased

from 8% for participants aged 20-29 (n=1458), to 17% (ages 30-39), 34% (ages 40-49), 53% (ages 50-59), and 77% (ages 60-69).

In the New Zealand Disability Survey conducted in 2013, HI was the highest self-reported sensory impairment (Statistics New Zealand – Tatauranga Aotearoa, 2013). In total, it reportedly affected 380, 000 people (9% of the total population). Thirty-four percent of men and 23% of women over the age of 65 reported HI. The National Foundation for the Deaf (n.d.) estimates that around 700,000 people in New Zealand live with some degree of HI which equates to 17% of the population. While the degree and definition of HI was not specified, this statistic is consistent with data from other countries such as the United Kingdom (Davis, 1989) and USA (Agrawal et al., 20008). Prevalence has not been estimated among the New Zealand population using objective audiometric measures.

In New Zealand, HI has been found to be 3.5 times more prevalent amongst persons aged 65 years and older compared to adults less than 65 years (Greville, 2005). Given the aging population in Western countries, it is probably that HI prevalence will continue to increase.

1.2.3 Impact of HI

The increasing prevalence of HI is concerning considering the impact HI has on individuals and society. The World Health Organization's International Classification of Functioning, Disability, and Health (ICF) model can be a useful tool for exploring the effects of HI. The ICF framework provides a standardized method for describing a person's health, functioning, and disability. Using the ICF framework (Figure 1), HI can be examined at the levels of body functions and structures, activity, and participation. Body functions refer to the physiological and psychological tasks performed by the body systems. Body functions are affected by HI, for example, HI reduces the ability to sense the presence of sound or

discriminate pitch. As previously explained, HI affects body structures, for example SNHI affects the structures of the inner ear.

Key consequences of HI are the ensuing activity limitations and participation restrictions. An activity refers to the execution of an action by an individual. Participation refers to involvement in life situations. When a person has difficulty executing an action (referred to as an activity limitation), the changes are at the level of the person. The activity limitations of a person with HI include reduced ability to understand conversations. Even a mild HI can impair verbal language processing (Olusanya, Ruben & Parving, 2006). Participation restrictions are the effects of activity limitations on broader aspects of life, for example, the inability to understand conversation can result in social isolation. Communication difficulties have also been found to affect health related quality of life and cognitive and emotional status (Dillon, 2012; Olusanya et al., 2006). Untreated HI has been linked to depression symptoms, anxiety, and decreased physical and psychosocial well-being (Dillon, 2012). Communication issues can also affect work productivity (Dillon, 2012). The World Health Organization (2014) reports that adults with HI have a much higher unemployment rate. Among those who are employed, a higher percentage of people with HI are in the lower grades of employment compared with the general population (World Health Organization, 2014).

The second part of the ICF involves Contextual Factors, namely Environmental Factors and Personal Factors (Figure 1). Environmental Factors refer to the physical and social environment and attitudes in which people live. For example, a reverberant, noisy restaurant can make it more difficult for a person with HI to converse with their communication partners. Personal Factors are the components of a person's life that influence their functioning or experience of disability such as age, race, gender, education, lifestyles, profession coping style, and social background (World Health Organization, 2002). For

example, a very anxious person with HI may experience more difficulty speaking on the phone compared to a person without high anxiety and with the same degree of HI.

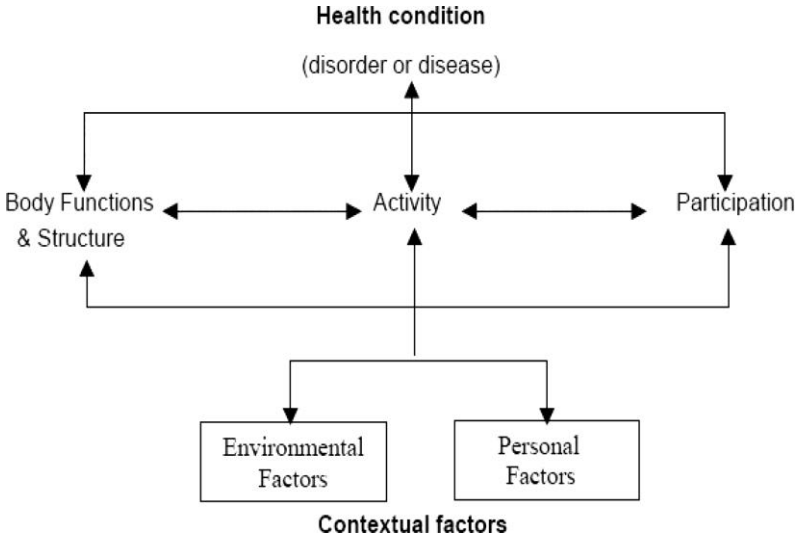

Figure 1.1. **The WHO-ICF model.**

The impact of HI even extends beyond the person with HI to their main communication partners such as their friends and family. Research has found that significant others experience as much frustration and anxiety as the person with HI (Scarinci, Worrall, & Hickson, 2009; Stark & Hickson, 2004). It is evident that HI has many negative impacts and it is very important that it is treated to reduce its effects on an individual.

1.3 Hearing Aids (HAs)

A key way of managing HI is through the use of HAs. HAs aim to reduce auditory impairment and so minimize activity limitations and participation restrictions. HAs are programmed to selectively amplify sounds based on the wearer's audiogram. There are numerous HA manufacturers who produce HAs in various styles, sizes, prices and technology levels. However, all HAs consist of the same key components pictured in Figure 2 including:

- A microphone, which detects sound and converts it into electric signals

- An amplifier, which increases the level of the signal based on the user's HI and preference
- A receiver, which is a miniature loudspeaker and transforms the electric signal back into an acoustic signal
- A coupler to the ear canal such as an ear mould
- A battery to power the system (Dillon, 2012; Kim & Barrs, 2006).

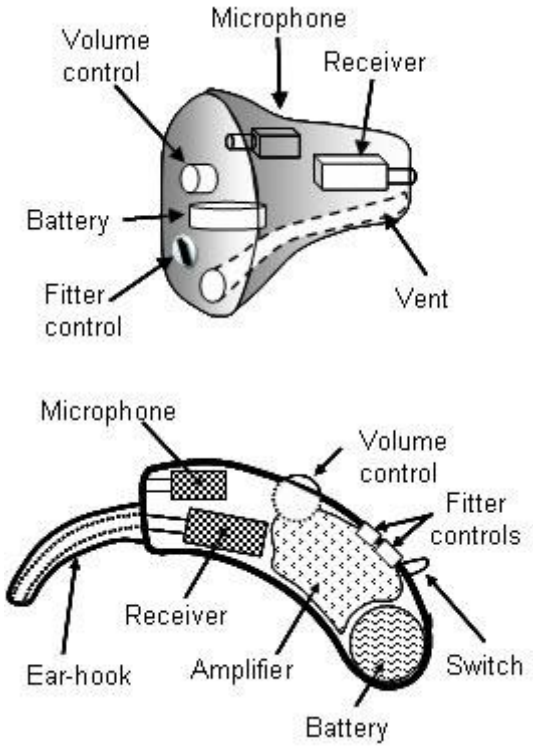

Figure 1.2. **Components of an in-the-ear (ITE) and behind-the-ear (BTE) HA (Dillon, 2012).**

Conductive HI requires amplification to simply increase loudness. Once signals are amplified enough to pass through the lesion in the outer or middle ear systems, normal processing of sound can occur in the inner ear. However, SNHI is much more complex making amplification more difficult. Firstly, audiograms slope downward in more than 90% of adults with SNHI (Macrae & Dillon, 1996). A lot of important speech information lies in the high frequencies. High frequency components of speech are weaker compared to the low frequency components and are thus harder to hear for people with high frequency HI (Byrne

et al., 1994). For these individuals, speech is loud enough but not clear enough (Dillon, 2012). Secondly, the loss of cochlear outer hair cells in SNHI makes it difficult to separate signals of similar frequency (Dillon, 2012). For example, it can be difficult to distinguish speech from noise of similar frequency. Therefore, individuals with HI require a greater signal-to-noise ratio to elevate speech above background noise. Decreased dynamic range is also an issue of SNHI and consequently for HA fittings. Dynamic range refers to the difference between an individual's threshold of audibility and loudness discomfort level. With SNHI, thresholds are increased while discomfort levels remain the same or less. This affects amplification as soft sounds need to be made audible but medium and loud sounds cannot be too loud (Kim & Barrs, 2006).

HAs currently use digital signal processing where sound is converted into numbers. Data is then processed before being reconverted into an acoustic signal which is delivered to the ear. Digital technology has many advanced features that helps overcome some of the issues of SNHI. For example compression allows soft inputs to be amplified more than loud inputs; this ensures soft sounds are audible to the listener but loud sounds are not uncomfortably loud. Other digital processing features include digital noise reduction, directionality, feedback suppression, frequency lowering and wireless connectivity (Dillon, 2012).

1.4 Impact of HA Adoption

The ICF framework can be used to examine the benefits of HAs by assessing the reductions in impairments to body functions and structures, activity limitations, and/or participation restrictions (Chisolm, et al., 2007). HAs aim to minimise the impairment of reduced body functions, e.g. they aim to provide sensation of certain sounds to a person who no longer detects those particular sounds. Improved body function with HAs can be measured

by comparing aided audiograms to unaided audiograms. HAs also reduce activity limitations; e.g. they use advanced digital processing technology to assist with hearing conversations in noise and hearing on the telephone (Dillon, 2012). HAs also decrease participation restrictions. Kochkin (2011) found that seven out of 10 patients reported an increase in their ability to communicate effectively in most situations with the use of HAs. HAs improve health related QoL even up to 12 months after HA adoption (Chisolm, et al., 2007; Mulrow, Tuley, & Aguilar, 1992). Kochkin (2011) found over 50% of HA users reported HAs improved their relationships at home, their social lives and their ability to join in groups. Elderly individuals with HI who use HAs are less likely to report sadness and depression, worry and anxiety, paranoia, decreased social activity, emotional turmoil, and insecurity compared with their peers with HI who do not wear HAs (Bagai, Thavendiranathan, & Detsky, 2006). Kochkin (2010) found that HAs can eliminate the income differential between people with normal hearing and people with HI by 90-100% for mild HI and 65-77% for severe HI.

Evidently, it appears that HAs reduce activity limitation and participation restriction yet HA uptake remains low. On average, a person is aware of a decline in hearing for 10 years before they consult for audiological services (Davis, Smith, Ferguson, Stephens, & Gianopoulos, 2007). For those who adopt HAs, it takes another 7 years on average before they actually do so (Kochkin, 2009). Even then, Kochkin et al. (2012) estimated only 25% of individuals with HI in the United States owned HAs. Greville (2005) estimates 28% of adults with HI in New Zealand own HAs. The World Health Organization (2006) estimates that only 1 out of 5 people worldwide who could benefit from a HA actually use one. Furthermore, surveys conducted in the United Kingdom, Australia, Finland, Denmark, and the United States found that between 1 and 40% of HAs dispensed are never or rarely used (Dillon et al., 1999; Hickson & Worrall, 2003; Lupsakko, Kautiainen & Sulkava, 2005;

Smeeth et al., 2002). Therefore, it is important to investigate HA outcomes in order to identify causes of low adoption rates and disuse of HAs.

1.5 Outcome Measurement

Outcomes are measured differences resulting from treatment. Outcome measurement is paramount for evidence-based practice. Evidence-based practice is a clinical approach where decisions are made based on an integration of the patient values, clinician experience and best available evidence (Cox, 2005). For a clinician to provide evidence-based practice, they must have up-to-date knowledge of the current management options. Hence, current research with various outcome measures is important to provide evidence for effective management. Outcome measures allow audiologists to demonstrate the positive effect of HAs on clients' functional status and quality of life (Uriarte, Denzin, Dunstan, Sellars, & Hickson, 2005). Saunders, Chisolm, & Abrams (2005) also identified outcome measurement as an important tool in all health care where there is a need to demonstrate treatment-efficacy for clients, provide evidence for third-party payment, carry out cost-benefit analysis, and justify allocation of resources. There are two general types of outcome measures within audiology: a) performance-based measures that compare aided versus unaided performance or performance of two different HAs; and b) self-reported measures that are used to rate auditory disability (activity limitation) or auditory handicap (participation restriction) with and without HAs, or to rate patient HA satisfaction (Saunders et al., 2005). As healthcare becomes more consumer-driven, clients' subjective impressions and self-perceived benefit is becoming more important (Cox, 2003). Beck (2000) identified client HA satisfaction as a key outcome measurement for treatment efficacy.

1.6 HA Satisfaction

1.6.1 HA satisfaction as an outcome measure

HA satisfaction has been described as a pleasurable emotional experience as an outcome of a performance evaluation; in other words the consumer feels that their needs, desires and goals have been fulfilled pleasurably (Wong, Hickson, & McPherson, 2003). It is a way of assessing service delivery by obtaining the perceptions and experience of clients. Satisfaction has been included as a measure of outcome in numerous studies suggesting that it is crucial to the HA fitting process and is of great importance in audiology. HA satisfaction can be thought of as the end point of the amplification journey. The first step of the journey is to seek help, second is to decide to acquire a HA (uptake), third is to decide to use an acquired HA, and ultimately, the goal is to be satisfied with the HA (Knudsen, Öberg, Nielsen, Naylor, & Kramer, 2010). HA satisfaction could thus be considered the ultimate outcome of the amplification process. "Put simply, care cannot be of high quality unless the patient is satisfied" (Vuori, 1989).

HA satisfaction is an important concept as satisfied owners use their HAs more than those who are not satisfied (Kochkin 2000). Kochkin (2000) also found that consumers who were "very satisfied" with their devices were three times more likely to recommend HAs to their friends compared to consumers who were "very dissatisfied." Consequently, satisfied HA users are excellent advocators for the use of HAs.

1.6.2 Prevalence of HA satisfaction

Before discussing prevalence of HA satisfaction in detail, it should first be noted that satisfaction *rates* and satisfaction *ratings* are two unique terms. The former refers to the percentage of participants who were satisfied with their instruments within a particular study. The later refers to the average satisfaction rating of all participants within a study which can

then be transformed into a percentage value. The use of two different measurements can make it difficult to compare findings between studies.

As stated previously, the mean HA satisfaction ratings on a 20-point scale were found to convert to 71% and 77% for a total of 229 New Zealand users (Purdy & Jerram, 1998; Jerram & Purdy, 2001). A wide scale survey of HA users in the United States documented an overall customer satisfaction rating of 78% for HAs that were less than 1 year old (Kochkin, 2005). Bertoli et al. (2009) used a single 4-point item to measure satisfaction and found 80% of users were satisfied with their devices in a national cross-sectional survey conducted in Switzerland. The accuracy and usefulness of these average ratings are questionable as the rating scale was not standardized and its psychometric properties were not examined. Furthermore, Hutton & Canahl (1985) have suggested that a single item measure of satisfaction does not have construct validity.

A recent study in Israel that used the SADL questionnaire (Cox & Alexander, 1999) found 92% of 109 HA users were satisfied to some degree with their HAs (i.e. had a global SADL score of 4 or more on a scale of seven). The average global SADL score was 5.12 (Kaplan-Neeman, Muchnik, Hildesheimer, & Henkin, 2012). Kaplan-Neeman et al. (2012) used a Hebrew version of the SADL. They tested construct validity and found moderate to strong correlation ranging between 0.6 and 0.8 ($p < .0001$) for the Global score and all subscales except the Personal Image scale. Internal reliability was acceptable as revealed by a Cronbach alpha of .76. In this study, participants completed the SADL over the telephone. Participants may have provided better scores since they were talking to an interviewer as opposed to anonymously completing a written questionnaire. Furthermore, some participants did not participate in the study due to difficulty conversing over the telephone so the data may have been skewed toward more successful HA users. Uriarte et al. (2005) also used the SADL to examine HA satisfaction among older Australian adults (mean age = 75.32 years).

The overall mean Global score of the 813 participants in this study was 5.27 (SD = 0.81). A Chinese version of the SADL has been developed and satisfaction levels were established to be 5.0 (SD = 0.9) (Fang, Chang, Wan, Wang, & Chen, 2013)

1.6.3 Measuring HA satisfaction

The various measures used in research on HA satisfaction make it difficult to draw strong conclusions about overall findings. Thus it is important to use published standardized questionnaires which allow comparison across participants and between studies. Furthermore, it has been argued that satisfaction questionnaires with multiple questions are more robust measures than single-scale items. Single-scale measures give a general picture of satisfaction but do not indicate why a client is satisfied or dissatisfied and do not allow the clinician to identify what can be changed to enhance satisfaction (Dillon, 2012).

1.6.3.1 Satisfaction with Amplification in Daily Life (SADL)

The SADL (Cox & Alexander, 1999) is a 15 item self-administered questionnaire which measures satisfaction. As well as measuring global satisfaction, it contains four subscales:

- Positive Effect, which evaluates improvement in performance and psychological benefit (six items)
- Service and Cost, which investigates dispenser competence, cost and product dependability (three items)
- Negative Features, e.g. feedback, noise, and telephones use (three items)
- Personal Image, which has items related to physical appearance (three items) (Cox & Alexander, 1999).

An example question is: “Are you convinced that obtaining your HAs was in your best interests?” For each question, respondents are required to choose the “best answer” from

a seven-point rating scale with one being “not at all” to seven being “tremendously.” Global satisfaction scores are based on the average score of all responses; subscale scores are the average of responses from items within that subscale. Higher scores indicate greater satisfaction.

Item development for the SADL was a thorough process which involved identifying important satisfaction elements via structured interviews (Cox & Alexander, 1999). An initial questionnaire was then developed and given to HA owners who indicated the relative importance of 14 HA satisfaction elements. Analyses revealed that elements could be placed within four content areas from which the four subscales were developed. A 25-item questionnaire was then developed and included items designed for each content area with highly salient as well as ambiguous items. After obtaining results with this questionnaire from 257 individuals, a final 15 item questionnaire was developed. Test-retest reliability ($r = 0.81$) and construct validity of the SADL has been evaluated by Cox & Alexander (1999, 2000). The construct validity and key psychometric properties of the measure were confirmed by Hosford-Dunn & Halpern (2000) who also established its use to validate HA satisfaction in private practice settings. Humes et al. (2002) compared the SADL to another somewhat standardised satisfaction measure, the expanded version of the MarkeTrak IV survey (Kochkin, 1996) which has been used in multiple large scale studies. It was found to correlate well with the latter questionnaire but is much shorter in length making it a more efficient measure. Indeed, Cox & Alexander (1999) report the SADL typically takes less than 10 minutes to complete. They also state it is written at a seventh-grade reading level.

Interim normative data have been established for the SADL questionnaire by Cox & Alexander (1999) to facilitate interpretation of scores. Norms were based on the responses of participants who responded to the original questionnaire and those who responded to the final questionnaire. Therefore, the number of participants used to develop norms varies depending

on the subscales as some subscales were changed for the final questionnaire and so data from respondents to the initial questionnaire could not be included. Participants were also only included in the normative data if all items within each scale were completed. Norms are presented in Table 1.2.

Table 1.2. **Mean, standard deviation and 20th and 80th percentile values for SADL Global and subscale scores (adapted from Cox & Alexander, 1999).**

Scale	N	Mean	SD	20^{th}	80th
Global	53	4.9	0.8	4.3	5.6
Positive Effect	257	4.9	1.3	3.8	6.1
Service and Cost	142	5.4	1.2	4.0	5.7
Negative Features	256	3.6	1.4	2.3	5.01
Personal Image	103	5.6	1.1	5.0	6.7

These norms are only provisional as questionnaires were mailed to participants from only three specific clinical sites: 1) a community speech and hearing centre, 2) a Veterans Affairs medical centre (all male respondents), and 3) a private practice audiology clinic. Furthermore, some of the normative data is based on relatively few participants. More data are needed to refine the precision of these values. Hence, results can be compared to these norms but caution must be taken when interpreting them.

The challenge with outcome measure measurement is that there can be a mismatch between outcomes that are important to the patient and that are important to the provider (Saunders et al., 2005). Using standardised measures try to reduce the issue of mismatched goals by providing a list of situations that presumably cause the most difficult for most patients with HI. The score is then useful for the clinician as it allows comparison with norms and/or between clients.

1.7 Factors Related to HA Satisfaction

1.7.1 Age

Kaplan-Neeman et al. (2012) found age had a varied effect on SADL scores among 109 HA users (average age = 65.2 ± 16.82). This correlational study reported a negative relationship between age and the Positive Effects subscale of the SADL but significance of findings were not reported. The authors speculated that as participants grew older, they became less satisfied with changes in acoustic information provided by their HAs and did not feel their devices helped enough in understanding general conversation. Conversely, a positive relationship was found between age and the Service and Cost subscale ($r = 0.01$, $p = .001$). Hence, as participants age they become more satisfied with the quality of the HA fitting, reliability, and cost/value of the devices. Perhaps older adults are more likely to utilize hearing rehabilitation services such as appointments for trouble-shooting and counselling during the trial period (Kaplan-Neeman et al., 2012). Hosford-Dunn and Halpern (2001) investigated the relationship between age and SADL scores for participants whose ages ranged from 61 to 101 years with a mean age of 76. Spearman's rho correlation analysis showed there was a small significant negative effect of age on global satisfaction ($N = 230$, $r_s = -.18$; $p < .005$), and Positive Effect ($N = 243$, $r_s = -.22$; $p < .005$). As effect sizes are .0324 for global satisfaction and .0484 for Positive Effect, only 3.3% and 4.8% of variance of these subscales was accounted for by age. Therefore these findings are less clinically meaningful. A more recent Australian study conducted by Uriarte et al. (2005) also found the correlation between age and mean SADL Global scores was not significant ($r [813] = 0.001$, $p > .05$).

Many older studies have found no significant relationship between age and satisfaction but these studies used generic satisfaction measures as opposed to validated questionnaires (Kochkin, 1992; Bentler, Niebuhour, Getta, & Anderson, 1993; Norman, George, & McCarthy, 1994; Brooks & Hallam, 1998; Hickson, Timm, Worral, & Bishop,

1999). Jerram & Purdy (2001) used regression analysis to predict HA satisfaction with independent pre-fitting measures. No significance was found between age and satisfaction among 162 New Zealand participants who ranged from 31 to 88 years (mean = 70.5, SD = 10.8). Chang et al. (2008) found no significant difference between a 65 to 80 years old group (N = 32) and a > 80 years old group (N = 27) when satisfaction was measured with a single item. Systematic reviews by Knudsen et al. (2010) and Wong et al. (2003) agree that literature overall indicates no or minimal correlation between age and HA satisfaction. There are some studies which are the exception. It should be noted that a large proportion of studies reporting on age involve participants over the age of 60 (Knudsen et al., 2010).

1.7.2 Gender

In order to establish normative data for the International Outcome Inventory for Hearing Aids (IOI-HA; Cox & Alexander, 2002), Cox, Alexander, & Beyer (2003) explored the relationship between multiple variables and satisfaction among 154 participants. Multivariate analysis of variance (MANOVA) analyses revealed there was no significant difference between mean satisfaction scores for male and female participants. Williams, Johnson, & Danhauer (2009) used the IOI-HA to investigate satisfaction among 160 participants with multichannel digital HAs but no significant effect was found between gender and satisfaction. Uriarte et al. (2005) found no significant difference between SADL Global scores for male and female participants when an independent groups t-test was conducted. Unfortunately there was no examination of the relationship between gender and the SADL subscales. Hickson et al. (1999) examined the relationship between gender and HA satisfaction among 52 older adults (aged 60 and above) who were first-time HA users. In this study, the Hearing Aid User's Questionnaire (HAUQ; Forster & Tomlin, 1988) was delivered over the telephone. The HAUQ consists of eight items; one measures satisfaction with the HA and one measures satisfaction with the cosmetic appearance of the HA. No relationship

was found between gender and satisfaction ($x^2 = .06$, df = 1, $p > .05$). Jerram and Purdy (2001) also found no significant effect between gender and satisfaction. None of the studies reviewed by Knudsen et al. (2010) found an association between gender and HA satisfaction. Wong et al. (2003) also noted that gender had no or minimal effect on satisfaction.

1.7.3 HA experience

The MarkeTrak IV survey found the average overall satisfaction rating of 54% for 800 new users was significantly lower than the average rating of 63% for 913 experienced users ($p < .001$) (Kochkin, 2000). Numerous other studies which examined the relationship between experience and satisfaction also concluded that users with previous experience were more satisfied than new users although correlation coefficients were low (Parving & Phillip, 1991; Stock, Fichtl, & Heller, 1997; Cox & Alexander, 2000; Kochkin, 2000, Hosford-Dunn & Halpern, 2001). The effect of length of experience has also been investigated in some studies. An item at the end of the SADL questionnaire can measure lifetime HA experience; it asks respondents if they have had less than six weeks, six weeks to 11 months, one to 10 years, or over 10 years experience with all old and current HAs. Using this measure, Hosford-Dunn and Halpern (2001) found length of experience had a positive effect on Negative Features ($r_s = -0.22$, $p < .005$). In the study by Uriarte et al. (2005), 1.3% of respondents had less than six weeks experience with HAs, 48.1% had six weeks to 11 months, 34.8% had one to 10 years, and 15.7% had more than 10 years. One way analysis of variance (ANOVA) testing revealed greater experience with HAs had a significant effect on the Global scale ($F = 8.60$, $p < 0.001$), Positive Effect ($F = 75.36$, $p < 0.001$), and Service and Cost ($F = 3.27$, $p < 0.05$) subscales.

Although Bertoli et al. (2009) reported length of ownership of current HAs related to HA dissatisfaction (OR = 1.4 – 1.32), they found no relationship between total HA experience and satisfaction. This study was conducted in Switzerland and involved 8707

adult HA owners. Jerram and Purdy (2001) found no significant difference in satisfaction among 61 new users and 101 experienced users. In a study involving 160 participants who completed the IOI-HA satisfaction questionnaire, Williams et al. (2009) found no differences in satisfaction for new versus experienced users. However, this may have been due to a ceiling effect as most patients were satisfied with their aids which may have inhibited detection of experience effects (Williams et al., 2009).

1.7.4 HI severity

Kaplan-Neeman et al. (2012) found degree of HI was significantly related to the SADL Personal Image subscale ($F = 6.1$, $p = .025$ for the right ear and $F = 12.2$, $p = 0.002$ for the left ears). Uriarte et al. (2005) found that HA users who had more severe HI (based on better ear three frequency PTA) were significantly more satisfied with their HAs (based on SADL Global scores) than those with less severe hearing. However, this correlation was very weak ($r = -0.100$, $p < .01$) and only 1% of the variance in SADL Global scores is accounted for by degree of HI making this relationship relatively unimportant. Hosford-Dunn & Halpern (2001) found a mixed relationship between SADL scores and HI severity based on four frequency (500, 1000, 2000, and 3000 Hz) PTA. Greater HI was related to reduced satisfaction for the Negative Feature subscale ($r_s = -.29$, $p < .001$) due to more problems with feedback and background noise. This may be less of an issue nowadays as changes have been made to HAs technology to improve feedback management. There was also a correlation between HI and three items of the Positive Effect subscale: item 3 ($r_s = .21$, $p < .001$), item 6 ($r_s = .20$, $p < .001$), and item 9 ($r_s = .27$, $p < .001$). However, calculation of effect sizes indicates that HI severity only accounted for 4 to 7% of the variance in HA benefit. Furthermore, HI severity was noted to interact with factors such as experience and daily use to influence subscales of the SADL (Hosford-Dunn & Halpern, 2001). Dillon, Birtles, & Lovegrove (1999) used the HAUQ to measure the relationship between satisfaction and

degree of HI (based on a 500, 1000, and 2000 Hz PTA). The study found a moderate negative correlation ($r = -.45$, $p < 0.05$). Effect size calculation shows that HI severity accounted for 20% of the variance in HA satisfaction. Dillon et al. (1999) notes that this correlation was established by four hearing centres in a state that had poorer than average outcomes and greater HI hence the correlation may not exist across the general population.

In the systematic review by Knudsen et al. (2010), five out of the seven articles that compared HA satisfaction and HI severity did not find an association hence it was concluded that overall degree of HI does not affect satisfaction (Gatehouse, 1994; Brooks & Hallam, 1998; Cox, Alexander, & Gray, 2007; Jerram & Purdy, 2001; Hickson et al., 1999). Wong et al. (2003) identified another five other studies that found no effect between these two variables (Scherr, Schwartz, Montogomery, 1983; Hutton & Canahl, 1985; Bentler et al., 1993; Norman et al., 1994; Dillon, James, & Ginis, 1997). Additionally, Bertoli et al. (2009) also found degree of HI was not a significant determinant of HA satisfaction among 8707 participants.

Wong et al. (2003) suggests that the studies which did not find a relationship between degree of HI and satisfaction may have achieved such results because of the similarity of HI severity within study participants. Studies with a wide range of HI may be better at showing the true relationship between HI and satisfaction (Wong et al., 2003). Furthermore, studies varied in their calculation of HI, e.g. one used better ear three frequency (500, 1000, and 2000 Hz) averages (Uriarte et al., 2005) while another used four frequency (500, 1000, 2000, and 4000 Hz) averages in both ears (Brooks & Hallam, 1998). Different methods of averaging may lead to different correlations with satisfaction ratings. Therefore, although no strong relationship has been consistently identified between HI severity and HA satisfaction, further investigation is warranted before it is eliminated as a factor.

1.7.4.1 Measurement of HI severity

Three-frequency PTAs have often been used in previous research and low- to mid-frequency thresholds (i.e., 500, 1000, and 2000 Hz) relate most to hearing disability (Lutman, Brown & Coles, 1987). However, there is a high density of information at 4000 Hz especially when there is a steep drop in hearing at the higher frequencies. Use of a four-frequency PTA has been found to improve prediction of signal-to-noise ratio loss compared to three-frequency averages (Killion & Niquette, 2000). Signal-to-noise ratio loss can be thought of as the loss of clarity of hearing whereas audiometric loss relates to the loss in sensitivity. Common causes of HI, noise-induced HI and presbycusis, have been found to affect high frequencies (between 3000 and 6000 Hz for NIHL and above 1000 Hz for presbycusis) (Feuerstein & Chasin, 2009; Weinstein, 2009). Hence a four-frequency average which includes 4000 Hz is a better indicator of hearing ability among these cases.

1.7.5 Hearing disability and handicap

The World Health Organization (1980) defines disability and handicap as two separate concepts. Disability is a restriction or lack of ability (resulting from an impairment) to perform an activity in the manner or within the normal range for a human being. This differs from handicap which is a disadvantage to an individual resulting from an impairment or disability that restricts or prevents the fulfilment of a role that is normal for that individual (depending on factors such as age and gender). Jennings, Cheesman, & Laplante-Lévesque (2013) investigated the relationship between hearing ability using the Self-efficacy for Situational Communication Management Questionnaire (SESMQ; Jennings, 2005) and handicap using the Hearing Handicap Questionnaire (HHQ; Gatehouse & Noble, 2004) and found that those who reported greater handicap did not report greater hearing difficulty which confirms that these are two separate entities. Unfortunately, these two items have often been

considered as one in previous research making it difficult to draw conclusions about their individual relationships with HA satisfaction.

1.7.5.1 Hearing ability

Instead of using the term disability, studies often measure a person's ability/difficulty to hear within certain hearing situations. Uriarte et al. (2005) reports that ANOVA results show a significant effect between unaided hearing difficulty and the SADL Global, Positive Effect, and Service and Cost scores ($p < .001$). More difficulty without HAs related to greater post-fitting satisfaction levels. Hosford-Dunn and Halpern (2001) also observed that perceived hearing difficulty increased the SADL Positive Effect score ($r_s = .25$, $p < .005$). Cox et al. (2003) found participants with more subjective hearing problems reported more satisfaction as measured by the IOI-HA ($p = .001$). Both of these studies measured hearing ability via a general "degree of hearing difficulty without a hearing aid" 4-point item at the end of the SADL scale.

On the other hand, Kochkin (1997) found participants with milder disabilities were more likely to gain HA satisfaction. Their increase in satisfaction may have stemmed from their improved directionality of sound and improved hearing in certain situations (e.g. when in large groups) (Kochkin, 1997). Many studies found no relationship between self-reported disability and satisfaction (Gatehouse, 1994; Norman et al., 1994; Dillon et al., 1997; Spitzer, 1998; Baumfield and Dillon, 2001; Humes et al., 2001). Differences in conclusions may be due to use of different measures of hearing ability and satisfaction. Even though disability and handicap have very different definitions, many measures do not separate them into two distinct entities as advocated for by Gatehouse (1994). As the relationship between disability and satisfaction is inconclusive and disability has not been analysed as an individual factor, there is a need for further investigation in this area.

1.7.5.2 Self-efficacy for Situational Communication Management Questionnaire (SESMQ)

The SESMQ (Jennings, 2005) was designed to measure hearing ability and perceived self-efficacy (explained later in this chapter) among adults with acquired HI. It includes descriptions of 20 situations such as, "Your friend/family member is trying to talk to you when she/he is in another room." For each situation, respondents are asked, "How well can you hear in this situation?" (hearing ability) and, "How confident are you that you can manage this situation?" (self-efficacy). Ratings for both questions are completed on 11-point (0-10) rating scales with the following word anchors for the hearing ability scale: "Not well at all," "Moderately well," and "Very well." Total hearing and perceived self-efficacy scores both range from 0 to 200 with higher scores indicative of greater hearing ability and perceived self-efficacy. The SESMQ was developed as an outcome measure and can be completed before and after audiological management to determine effectiveness of treatment.

The SESMQ has been psychometrically evaluated for adults over the age of 50 by Jennings et al., (2013). Content validity was assessed by a panel of five audiologists and five adults with acquired HI who reduced the initial pool of 30 items down to 20 items. The final 20 items cover situations with unfamiliar and familiar persons in private and public environments. The final version of the SESMQ was found to have good content validity with a Content Validity Index score of 0.86. Jennings et al. (2013) reports the SESMQ to be a reliable measure due to high test-retest reliability as indicated by a large and statistically significant intraclass correlation coefficient (0.94, $p < 0.01$). Factor analysis revealed a two-factor solution suggesting that hearing ability and perceived self-efficacy are different entities with both having a role in determining how well situations are managed by the participant. However, the two scales were significantly correlated overall ($r = .62$; $p < 0.01$). High internal consistency was also indicated by a high Cronbach's α of 0.96 for the overall test,

0.93 for the hearing ability scale and 0.94 for the self-efficacy scale. This indicates that the items from the questionnaire and from its individual subscales are related. Thus the SESMQ is a reliable and valid tool that has had its psychometric properties thoroughly examined and that has been used in research (Laplante-Lévesque et al., 2012) with promising results.

1.7.5.3 Hearing handicap

Laplante-Lévesque et al. (2012) found greater self-reported pre-intervention hearing handicap as measured by the Hearing Handicap Questionnaire (HHQ) (Gatehouse & Noble; 2004) was associated with more successful HA intervention outcomes. In a regressive study Hickson, Meyer, Lovelock, Lampert, & Khan (2014) investigated HHQ scores among 160 individuals, 60 years or older, fitted with HAs for the first time in the previous two years. HA users completed a modified version of the HHQ which aimed to determine their handicap prior to obtaining HAs. It was found that participants who reported more difficulties on the HHQ were more likely to be successful HA owners (as defined by more than 1 hour of HA use per day and at least moderate benefit) ($p < .05$). Fuhrer, Rintala, Hart, Clearman, & Young (1992) found life satisfaction was related to social handicap (e.g. the ability to play their social role) rather than the degree of impairment or disability among persons with spinal cord injury. A search through published research indicated hearing handicap has not been investigated in regards to satisfaction making it a subject worthy of further examination.

1.7.5.4 Hearing Handicap Questionnaire (HHQ)

The HHQ was developed by Gatehouse & Noble (2004) to evaluate the effect of hearing disability on emotional handicap. This questionnaire consisting of 12 five-point items assesses the negative emotional effects (e.g. emotional distress and discomfort) and social effects (e.g. participation restrictions) caused by hearing difficulties (Gatehouse & Noble, 2004). It was derived partly from items in the Hearing Disabilities and Handicaps Scale (Hétu et al., 1994) and partly from items in an unpublished general health scale (the Glasgow

Health Status Inventory which is a version of the Glasgow Benefit Inventory by Robinson, Gatehouse, & Browning, 1996). Wording was adjusted to ask specifically about effects of HI. Items were selected for the HHQ so that it only assesses handicap as opposed to hearing disability. The content of each item is arranged to be independent of any particular listening circumstance. Psychometric testing of the HHQ revealed a single factor structure (Gatehouse & Noble, 2004) and good internal consistency (Cronbach's $\alpha = 0.93$) (Hickson et al., 2007).

1.7.6 Perceived self-efficacy

1.7.6.1 Overview

The concept of perceived self-efficacy was developed by Bandura (1977) as part of a social cognitive theory. Self-efficacy is defined as the belief in one's capabilities to perform the tasks required to manage prospective situations (Bandura, 1995). An individual with high self-efficacy believes they have the skills necessary to effectively problem-solve, set goals, and plan and carry out actions. They believe they can be adaptive in their coping, and undertake (rather than avoid) difficult situations (Jennings et al., 2013). Perceived self-efficacy is relevant to audiology as it may affect a person's response to audiological rehabilitation (Jennings et al., 2013). A person with high self-efficacy will be more determined when facing difficulties; hence they are more willing to engage in conversations and persist with HAs despite difficulties with handling, adjustment or perceived benefit (Tye-Murray, 2009; West & Smith, 2007). In audiology, self-efficacy has been investigated in terms of communication strategies training (Jennings, 2005) and HA intervention (Smith & West, 2006; West & Smith, 2007). Communication self-efficacy is the belief individuals have in their ability to manage communication in everyday environments (Jennings, 2005). HA self-efficacy is the belief individuals have in their ability to perform the skills needed to be successful HA users (West & Smith; 2006).

1.7.6.2 Previous findings

In a study involving 139 adults over 50 years old with HI, Laplante-Lévesque et al., (2012) investigated communication self-efficacy as a predictor of uptake and successful outcome of HAs or communication programs. Participants who reported higher communication self-efficacy were significantly less likely to obtain HAs (OR = 0.97) perhaps because they are more likely to either complete communication programs or use their own resources to address hearing disability (Laplante-Lévesque et al., 2012).

Perceived self-efficacy, as measured by the Measure of Audiologic Rehabilitation Self-Efficacy for HAs (MARS-HA; West & Smith, 2007), has been found to influence help-seeking for 307 older adults (≥ 60 year old) (Meyer, Hickson, Lovelock, Lampert, & Khan, 2014). Self-efficacy for HA adjustment (MARS-HA Factor 3) was significantly higher among 93 individuals who consulted for audiological services versus 55 non-consulters ($p < .001$). Self-efficacy for basic HA management (MARS-HA Factor 2) was also significantly higher among those who decided to trial HAs ($p < .001$). Hickson et al. (2014) found that older adults (≥ 60 years old) who had greater self-efficacy for advanced management of a HA, as measured by MARS-HA Factor 4, were more likely to report a successful HA outcome. MARS-HA subscale scores were significantly higher ($p < .01$) among the successful HA owner group (N = 85) compared to the unsuccessful HA owner group (N = 75).

Although these studies show that self-efficacy affects audiological rehabilitation outcomes, no research was found on the relationship between self-efficacy and HA satisfaction. This is an area worthy of investigation as a study by Cicerone & Azulay (2007) found a significant and strong association between self-efficacy for managing cognitive symptoms and global life satisfaction among 97 adults with traumatic brain injuries. Furthermore, given the relationship between self-efficacy and other outcome measures, it is

plausible to expect there to be a relationship between HA satisfaction and self-efficacy. For example, if low self-efficacy causes non-use or discontinued use of HAs, it is likely that clients are also not satisfied with HAs. Both HA and communication self-efficacy are under-researched areas which are worthy of further investigation.

1.7.6.3 SESMQ

Self-efficacy for managing communication in everyday environments can be measured with the SESMQ (Jennings, 2005). For the purpose of developing the SESMQ, perceived communication self-efficacy was defined by Jennings (2005) as "an individual's judgment of his/her capabilities to mobilize the motivation, cognitive resources and courses of action needed to meet the demands of the range of everyday difficult listening environments." As explained previously, respondents rate their perceived self-efficacy for 20 given situations on an 11 point rating scale which ranges from "Not confident at all" (0), to "Moderately confident" (5), to "Very confident" (10).

Jennings et al. (2013) found that SESMQ scores were negatively correlated to HHQ scores (Gatehouse & Noble, 2004). In other words, respondents who reported greater emotional handicap also reported less confidence in managing situations identified in the SESMQ although they did not have greater difficulty hearing in these same situations. Self-efficacy was not found to relate to age, degree of HI, duration of HI, or duration of HA use indicating it is a factor by itself. It is interesting that these questionnaires have been found to correlate as both will be used in this study. Jennings et al. (2013) noted that change in self-efficacy after intervention could be measured to quantify benefit from intervention. Thus, completion of the SESMQ both before and after fitting of HAs could be useful to determine if change in self-efficacy relates to HA satisfaction,

1.7.6.4 Measure of Audiologic Rehabilitation Self-Efficacy for HAs (MARS-HA)

HA self-efficacy can be examined with the MARS-HA (West & Smith, 2007) which was designed specifically for this purpose. The MARS-HA consists of 24 items. For each item respondents indicate on an 11-point rating scale how confident they are that they could perform a given task from "Cannot do this at all" (0%), to "Moderately certain can do" (50%), to "I am certain I can do this" (100%).

West & Smith (2007) evaluated the psychometric properties of the MARS-HA for new and experienced HA users with separate analysis for the two participant groups. Factor analysis was completed and identified the following subscales:

1) Aided listening, e.g. group conversations, using telephones etc.
2) Basic handling, e.g. battery and HA insertion and removal
3) HA adjustment, e.g. getting used to own voice, physical fit, etc.
4) Advanced handling, e.g. stopping a HA from squealing (West & Smith, 2007).

As expected, there were strong correlations between items of the same subscale (average $r = 0.54$ for new users and $r = 0.49$ for experienced users) and lower correlations between items of different subscales (average $r = 0.27$ for new users and $r = 0.25$ for experienced users) (West & Smith, 2007). Overall internal consistency reliability was high for the MARS-HA (Cronbach's $\alpha = 0.92$ for new users and 0.91 for experienced users) (West & Smith, 2007). For the subscales, alpha values all met the recommended level of 0.7 for internal consistency reliability except for the experienced users on the advanced handling subscale (Cronbach's $\alpha = 0.67$) (West & Smith, 2007). This indicates that there is a strong relationship among the subscale items, and items across the entire scale were well-integrated. Furthermore, all Pearson product moment correlations that were calculated between subscales were significant at the 0.01 level (two-tailed) with an average correlation value of 0.47 for

new users and 0.42 for the experienced users (West & Smith, 2007). This further indicates that the MARS-HA subscales are related to each other but are non-overlapping. Each of the four subscales also correlated well with the total scale ($r = 0.64 - 0.84$).

West & Smith (2007) found good test-retest reliability for the total scale for both new users ($\lambda = 0.92$) and experienced users ($\lambda = 0.88$) when the test was re-administered two weeks after the initial completion. Correlations were also high between the two scales for both groups, $r = 0.86$ for new users ($N = 53$) and $r = 0.79$ for experienced users ($N = 75$).

West & Smith (2007) investigated construct validity by comparing scores on the MARS-HA and the Hearing Handicap Inventory for the Elderly Screening Version (HHIE-S) (Ventry & Weinstein, 1983). As expected, items of the MARS-HA and the HHIE-S did not load on the same factors; this supports the validity of the MARS-HA as an independent measure (West & Smith, 2007). Validity was also indicated by the different patterns of responses to the MARS-HA by various groups of participants. For example, experienced users were more confident at being able to stop squealing on the HA compared to new users (West & Smith, 2007). Finally, criterion validity was examined to validate the MARS-HA as a measure of self-efficacy that is responsive to changes over time by examining the impact of HA use on MARS-HA responses. A sample of new users was recruited and they completed the MARS-HA before being fitted with HAs and again one month later. Results showed a main effect for time [$F(1, 28) = 77.4$, $p < 0.001$] due to significant increases in self-efficacy between administration times (West & Smith, 2007).

Therefore, overall results indicate that the psychometric properties of the MARS-HA are strong for both new and experienced users making it a reliable and valid tool for measuring self-efficacy.

1.7.7 Daily hours of HA usage

Kaplan-Neeman et al. (2012) found a moderately significant correlation between hours of HA use per day and satisfaction ratings on the Positive Effects subscale of the SADL ($r = 0.45$, $p < .0001$) with longer hours of use relating to higher satisfaction ratings. Furthermore, there was a positive relationship between hours of use and the Service and Cost subscale ($r = 0.45$, $p = 0.028$). Similarly, Uriarte et al. (2005) noted a significant positive effect of HA use on Global satisfaction ($F_{5,799} = 35.00$, $p < .001$). Bertoli et al. (2009) found overall 'non-regular' use of aids (as reported by the participant) was significantly associated with lower degrees of satisfaction (ORs increasing from 1.92 to 5.42),

Older research agrees with these findings. In general, higher use correlates with greater satisfaction (Dillon et al., 1991; Brooks, 1985; Salomon, Vesterager, & Jagd, 1988; Kochkin, 1997). However it has been noted that there are many satisfied clients who only use their HAs for small amounts of time (Kochkin, 1997; Dillon et al., 1999). In terms of New Zealand data, Jerram & Purdy (2001) found that participants who wore their HAs more had higher satisfaction ratings.

Overall, it seems that greater HA use has a positive relationship with satisfaction however previous studies have varied in their measurement method. Aid usage can be estimated based on average daily hour of usage or in terms of frequency of use (e.g. "often," "sometimes"). Furthermore, these studies relied on self-report of HA usage which can be inaccurate (Brooks, 1979; Taubman, Palmer, Durrant, & Pratt, 1999). Therefore it would be beneficial to confirm results with a more accurate measure of HA usage, for example data-logging systems on HAs.

1.7.8 Number of appointments

Kochkin et al. (2010) found that HA "success" was strongly related to fewer number of visits required to fit HAs. "Success" was a composite measure derived from factor analysis of the following variables: HA usage, patient recommendations, benefit and satisfaction ratings. Satisfaction ratings were based on the percent of listening situations (out of 19 self-selected important ones) in which the patient was "satisfied" or "very satisfied." Users with above-average success were more likely to have their HA fit in one or two visits compared to users with below-average success. Nearly half of the users with below-average success had 4 or more visits. Humes (1999) also discusses the possibility that number of return visits for either repair or adjustment following HA delivery could be an objective measure of satisfaction. Humes (1999) assumed that more visits to resolve complaints indicate less satisfaction of the HA user. On the other hand, Hosford-Dunn and Halpern (2001) found no significant correlation ($p > .005$) between either total visits (number of clinical appointments) or total time (sum of clinical appointments in minutes) and any of the SADL scale scores. The fitting procedure in the study by Hosford-Dunn and Halpern was very extensive. Participants received their first follow-up visit between 48 hours and one week post-fitting (depending on the HA style). They then received weekly follow-up appointments until the patient expressed satisfaction with amplification in daily life. Subsequent follow-up appointments were then scheduled quarterly or biannually. The mean and range for the number of visits and visit time were not reported so it is difficult to compare these findings to other data. It is unknown if the range in number of appointments was enough to result in a significant finding.

1.8 Rationale

Two studies have discussed HA satisfaction among a New Zealand sample (Purdy & Jerram, 1998; Jerram & Purdy, 2001). It is possible that HA satisfaction has increased since these studies were completed. In 2001, Vuorialho, Sorri, Nuojua, & Muhli (2006) essentially repeated the methods of a study conducted in 1983 (Sorri, Luotonen, & Laitakari, 1984). It was found that 89.5% of 76 first-time HA users were satisfied with their devices in 2001 compared to 69.3% of 150 HA users in 1983. Therefore, HA use and satisfaction increased in the 20 years between studies. Furthermore, recent SADL research conducted by Kaplan-Neeman et al. (2012) found a Global satisfaction rating of 5.12 which is higher than the rating of 4.9 established by Cox & Alexander (1999). There are several potential reasons for these increases in satisfaction. Firstly, satisfaction rates may have risen with the development of digital programmable HAs. Also, it is argued that fitting procedures have become more individualized, counselling of HA users has increased and people have become more used to technology (Vuorialho et al., 2006). Lastly, device style has changed dramatically. In the later study conducted by Vuorialho et al. (2006), 86.8% (66) HAs were BTEs, 11.8% (nine) were ITEs and 1.3% (one) was a body worn aid. Contrastingly, in the 1983 study (Sorri et al., 1984), 64.7% (97) of HAs were BTEs and 35.3% (53) were body-worn (Vuorialho et al., 2006). Consequently HAs in the 2006 study were much less obtrusive and moulds were custom-made. Currently, many manufacturers produce very small Receiver-in-the-Canal or (RIC) or Receiver-in-the-Ear (RITE) HAs and small BTEs. RICs and RITEs attach to the receiver in the ear or canal via a very small wire and BTEs attach to a small ‘dome’ in the ear via a slim tube. Thus there is the option for very discrete HAs (depending on the HI severity). Therefore as both New Zealand studies were conducted over 10 years ago, it is important to collect current data on HA satisfaction.

There is no known New Zealand HA satisfaction data that uses standardized satisfaction measures. Standardized data would be useful as it would allow comparison to findings of other studies. While multiple HA satisfaction studies have been conducted overseas, it is possible that results vary between countries and cultures. Uriarte et al. (2005) compared SADL data from Australian participants to the provisional norms based on American clients by Cox & Alexander (1999). A statistically significant difference was found across all SADL subscale scores for Australian data versus the American data. The Australian group had a mean SADL Global score of 5.27 versus a score of 4.9 for the American group. It is possible that differences in service delivery and HA funding between countries could lead to differences in HA satisfaction. However, it should be noted that the Australian study was published six years later and it is possible that changes in HA technology could also be at least partly responsible for the differences in findings. Bertoli et al. (2009) conducted a study in Switzerland to investigate the differences in satisfaction among 7891 HA adult users across three different language regions (German, French and Italian). This study used a single-item satisfaction scale as opposed to a standardized measure. Participants were asked, "Are you satisfied with you HA?" and had the response options of "very satisfied," "rather satisfied," "rather dissatisfied," and "very dissatisfied." Overall, 80% of users were satisfied with their devices but satisfaction was higher among the French-speaking group. As HA dispensing conditions are the same across the country, Bertoli et al. (2009) argues that the differences in satisfaction are due to cultural differences. Indeed, cultural differences have been found in other areas of healthcare such as differences in attitude toward organ donation between the three language groups of Switzerland (Schulz, Nakamoto, Brinberg, & Haes, 2006). Therefore, it would be interesting to gather HA satisfaction data specific to the New Zealand population and compare it to the findings of overseas research.

It is also important to investigate the factors related to HA satisfaction as this provides clinicians with evidence that may be useful for improving client satisfaction. There is a vast amounts of research published on various factors but some require further investigation. Factors such as age and HA experience have had mixed results regarding their relationship to satisfaction. Differences in results may be due to variations in study design, sample populations, and/or HA technology. It is important to resolve the discrepancies of previous research and determine the current relationship between these variables and HA satisfaction. Other factors (e.g. self-efficacy) have been reasonably well-researched but not in terms of HA satisfaction and not among a New Zealand population. Overall, it would be beneficial to clinicians in New Zealand and overseas for more research to be conducted on the relationship between the selected factors and satisfaction. More information on this subject will assist them in providing services which increase client HA satisfaction.

1.9 Aims and hypotheses

Thus, the aim of this study was to further investigate HA satisfaction ratings and the factors related to satisfaction among HA users in New Zealand. More specifically, this study sought to answer the following three questions:

1) What are the current HA satisfaction levels among a sample of adult HA users in New Zealand?
2) How do the satisfaction ratings of this study compare to both the provisional normative SADL data provided by Cox & Alexander (1999) and more recent SADL data?
3) Which of the following client factors are related to HA satisfaction: age, gender, HA experience (new versus experienced), years of HA experience (among experienced users), HI severity, hearing ability, change in hearing ability, hearing handicap,

communication self-efficacy, change in communication self-efficacy, HA self-efficacy, average daily hours of usage, and number of appointments.

Based on the literature discussed above, the following hypotheses are proposed:

1) a) At least 97.5% of participants will fall within or above the SADL norms published by Cox & Alexander (1999)

   b) Mean SADL scores will be higher in this study compared to the mean scores established by Cox & Alexander (1999)

   c) Mean SADL scores of this study will be comparable to more recent findings such as those found by Kaplan-Neeman et al. (2012) and Uriarte et al. (2005)
2) There will be no relationship between age and HA satisfaction
3) There will be no relationship between gender and HA satisfaction
4) a) HA satisfaction will be higher among experienced HA users compared to new users

   b) Years of HA experience will positively relate to satisfaction
5) HI severity will not relate to HA satisfaction
6) a) Pre-fitting hearing ability will relate to post-fitting satisfaction

   b) Change in hearing ability will relate to HA satisfaction
7) Hearing handicap will relate to satisfaction
8) a) Pre-fitting communication self-efficacy will relate to HA satisfaction

   b) Change in communication self-efficacy will relate to HA satisfaction
9) HA self-efficacy will relate to HA satisfaction
10) Average daily hours of usage will relate to satisfaction
11) Fewer fitting appointments will relate to greater satisfaction.

Chapter Two: Method

This research employed a non-intervention descriptive cross-sectional survey design to investigate satisfaction levels and relationships between client factors and HA satisfaction among adult HA users in New Zealand. The following subsections describe the *a priori* analysis, participants, measures, procedures, and statistical analysis of this study.

2.1 A Priori Power Analysis

An *a priori* analysis was completed to determine sample size and was influenced by the number of independent variables (13), an alpha-level of .05 and a power level of .80 (the standard level in research). The aim of this study was to detect Pearson correlations of at least 0.30. Given these factors, 85 participants were required for this study.

2.2 Ethical Approval

Approval of this study's procedures was gained from the University of Canterbury Human Ethics Committee on 16 July 2014 (Appendix 1). All procedures were carried out in accordance with the approval. This study did not require approval from the New Zealand Health and Disability Ethics Committee.

2.3 Participants

Participants were recruited by clinicians from nine clinics within the same private audiology company in New Zealand. Clinicians were informed of the overall nature and purpose of this project and were asked to invite every client who met the study's inclusion and exclusion criteria to participate. If the initial client declined, the clinicians were to continue to invite clients until their designated quota of participants (10 per clinic) was

successfully recruited. Therefore, this study employed the use of convenience sampling. Recruitment started on 14 August 2014 and took place over a three month period.

It was important that participants were adults given the length and complexity of the questionnaires that they needed to complete. Participants could be new or experienced HA users. Therefore the inclusion criteria for this study were that the client:

1) had been diagnosed with a HI via audiological diagnostic assessment

2) had completed a hearing needs assessment with the outcome that he or she would likely benefit from HAs

3) had decided to trial a HA(s)

4) was over the age of 18 years.

Clients were excluded if they:

1) Needed to be medically referred to their general practitioner or an otorhinolaryngologist following audiological assessment
2) were currently experiencing an ear infection (including otitis externa, otitis media and/or discharge)
3) currently had an ear deformity.

Clients were excluded for the above factors as it was thought that they were not representative of the typical HA population.

2.3 Measures

The independent variables investigated in relation to HA satisfaction were: age, gender, HA experience (new versus experienced), years of HA experience (among experienced users), HI severity, hearing ability, change in hearing ability, hearing handicap,

communication self-efficacy, change in self-efficacy, HA self-efficacy, average daily hours of usage, and number of appointments. The outcome measure of this study was client satisfaction with HAs as measured via the SADL questionnaire (Cox & Alexander, 1999). Variables were obtained primarily through two participant questionnaires: the Pre-fitting and Post-fitting Questionnaires (Appendices 2 and 3). These were a compilation of a variety of published questionnaires and questions designed specifically by the researcher. Details on how each variable was measured are discussed below.

2.3.1 Age and gender

Age and gender were recorded in the Pre-fitting Questionnaire (Appendix 2). Participants were asked to provide their date of birth and their age was calculated for the date they completed the consent form. Participants were asked to report their gender by selecting one of the following options: female, male, or other.

2.3.2 HA experience

The Pre-fitting Questionnaire included a two-part question on HA experience. Firstly, participants were asked if they had used HAs before; this allowed for comparison between new and experienced users. Secondly, participants were asked to provide the number of years they wore HAs for if the answer to the first section was 'yes.' This facilitated investigation into the effect of number of years of experience on satisfaction.

2.3.3 Degree of hearing loss

The audiometric variable used to quantify degree of hearing loss in this study was the pure tone average (PTA) of air-conducted thresholds across four selected frequencies (500, 1000, 2000, and 4000 Hz) for an individual ear. This thesis investigated the relationship between HA satisfaction and the PTAs of both the better (BEPTA) and worse ear (WEPTA).

Bilateral pure tone audiometry was completed for all participants. The private clinic's protocols require a recent audiogram (less than 6 months old) for the fitting of HAs. Most of the audiograms were obtained by clinicians at the client's audiological assessment appointment. Clinicians were not provided with specific instructions for obtaining audiograms for this project but were instead expected to follow standard clinic protocols. Therefore, they were to complete otoscopy and provide the client with instructions on how to perform the pure tone audiometry assessment. For the hearing assessment, pure tones were presented to the participant using calibrated 2-channel Interacoustic AC33, GN Otometric Aurical, or MedRx Avant audiometers. Transducers for air conduction thresholds were either ER-3A insert earphones or TDH-39P supra-aural headphones. Bone conduction thresholds were gathered with Radioear Type B-71 bone vibrators placed on the mastoid bone. Calibration of instruments was in accordance with the NZAS guidelines and met either ANSI S3.7-1995 (R2003) or IEC 60645-1 2001 standards. Audiometry was completed in sound-treated booths or rooms which met the ANSI standard for maximum permissible ambient noise for audiometric assessment rooms (ANSI S3.1-1999 (R2003)). Pure tone audiometry was obtained using the Modified Hughson-Westlake ascending method (Carhart & Jerger, 1959). To obtain an audiogram, air conduction thresholds were recorded at one octave intervals from 250 to 8000 Hz; inter-octave thresholds were obtained if there was a 20 dB or greater difference in thresholds between adjacent octave frequencies. Bone conduction thresholds were obtained at 500, 1000, 2000 and/or 4000 Hz if air conduction thresholds exceeded 20 dB HL at those frequencies. Clinicians completed air and bone conduction masking as required.

If a "no response" was obtained on at 500, 1000, 2000, and 4000 Hz on an audiogram, the maximum level at which no response was obtained was included in the pure tone average. Therefore, pure tone averages closely approximated the participant's thresholds but were not

entirely accurate especially because the maximum levels differed between audiometers. However, leaving "no responses" out of the averages would have given averages that were better than the actual hearing of the participant.

2.3.4 Self-efficacy for Situational Communication Management Questionnaire (SESMQ)

The SESMQ (Jennings et al., 2013) was included in the Pre-fitting Questionnaire to measure pre-fitting hearing ability and communication self-efficacy (questions 7 to 26). It was also included in the Post-fitting questionnaire so change in hearing ability and self-efficacy could be measured (questions 1 to 20). The SESMQ consisted of 20 questions about hearing ability and self-efficacy in different situations (see Figure 1 for an example). Each question contained two parts. The first section (which measures hearing ability) required respondents to rate how well they can hear from 0 ("Not well at all") to 10 ("Very well"). In the second part of the question (which measures perceived self-efficacy), respondents rated their degree of confidence in managing communication in the situation from 0 ("Not confident at all") to 10 ("Very confident").

Scores from each question were then summed to form separate hearing ability and perceived self-efficacy total scores which can range from 0 to 200. Higher scores indicated greater hearing ability and greater confidence. The hearing ability and perceived self-efficacy scores were statistically analysed separately so the relationships between both variables and satisfaction were investigated. The difference between pre-fitting and post-fitting scores were calculated to determine change in hearing ability and self-efficacy.

2.3.6 Hearing Handicap Questionnaire (HHQ)

Hearing handicap was measured via the HHQ (Gatehouse & Noble, 2004) in the Pre-fitting Questionnaire (questions 27 to 28). The HHQ consisted of 12 questions and required

participants to rate how often they feel handicapped by their hearing in each situation. Answers for each item could be selected from the following five options: A ("Never"), B ("Rarely"), C ("Sometimes"), D ("Often"), and E ("Almost always").

While the HHQ originally used the letters "i" to "v," the letters were changed to "A" to "E" in the Pre-fitting Questionnaire so as to be consistent with the SADL in the Post-fitting Questionnaire. Scoring of the HHQ followed the method outlined by Gatehouse & Noble (2004). The scores of the 12 items were converted into numerical values, 1 to 5, and were averaged to gain the individual's global handicap score. These values were then scaled to have a possible range of 0 to 100. A higher HHQ score indicated greater handicap (Gatehouse & Noble, 2004).

2.3.7 Measure of Audiologic Rehabilitation Self-Efficacy for HAs (MARS-HA)

HA self-efficacy was measured via the MARS-HA questionnaire (West & Smith, 2007) which was included in the Post-fitting Questionnaire (questions 21 to 44). The MARS-HA consisted of 24 situations in which the participant indicated how confident they were at performing the given HA-related tasks, adjusting to HAs, or hearing in certain situations. Participants were instructed to make their best guess about how well they would do if they had never been in the given situations. Participants could select a rating from an 11-point item which ranged from 0% ("Cannot do this at all") to 100% ("I am certain I can do this"). Scores for each of the four subscales and the total score for the MARS-HA were based on the averages of items and so could range from 0 to 100%.

2.3.8 Daily usage hours and number of appointments

Data-logging systems on HAs recorded the average number of hours the HAs were turned on for each day. The participants' clinicians were asked to pass this information on to the researcher via the Clinician HA Information form completed at the end of the fitting

process (see Appendix 4). This measure served as an estimate of the average hours of HA usage per day.

The number of visits used to fit the HAs, from the initial fitting session to the session in which the client finalised their HA purchase, was also recorded on the form and passed on to the researcher.

2.3.9 Outcome measure: Satisfaction with Amplification in Daily Life (SADL)

The outcome measure of satisfaction was measured in the Post-fitting Questionnaire via the SADL (Cox & Alexander, 1999). The SADL consisted of 15 questions which required participants to rate their opinions on HAs in certain situations. Response options were: A ("Not at all"), B ("A little"), C ("Somewhat"), D ("Medium"), E ("Considerably"), and G ("Tremendously"). Results were scored according to the online scoring guide (Hearing Aid Research Lab, 2003). Items were separated depending on the subscale they belonged (Table 2.1). For non-reversed items, answers of A, B, C, D, E, F, G were converted into numerical values of 1, 2, 3, 4, 5, 6, 7 respectively. However, for the four reversed items (Table 2.1), answers of A, B, C, D, E, F, G were assigned the values of 7, 6, 5, 4, 3, 2, 1 respectively. An average score was then calculated for each subscale. Item 11 was omitted from the mean score for the Negative Features subscale and Global scale if the respondent checked the box indicating they hear well on the telephone without HAs. The Global Score was the mean of all scores.

Table 2.1. **SADL Subscale Items.**

Scale	**Items (*) = reversed item**
Positive Effect	1, 3, 5, 6, 9, 10
Service & Cost	12, 14, 15
Negative Features	2*, 7*, 11
Personal Image	4*, 8, 13*

2.4 Procedure

Clients were invited to participate in this study once they had agreed to trial HAs which generally took place at the end of a hearing needs assessment session. Clinicians provided them with an information sheet summarizing the study and what was required of them. If the client agreed to participate, they were required to sign a consent form. Participants were then given the Pre-fitting Questionnaire. They were instructed to complete it in their own time and bring it back to their initial HA fitting session.

The remainder of the fitting process followed the standard protocols of the private clinic and was unaffected by this project. The protocols for a HA fitting appointment at this clinic required clinicians to do the following:

- discuss expectations
- perform otoscopy
- check the physical comfort of the HAs
- complete verification of HAs using real-ear measurements (REMs) and adjust HA gain to meet targets
- ask the client about subjective sound quality and adjust the HAs accordingly
- address issues of feedback and occlusion
- counsel the client on the care and use of aids
- encourage the client to contact the clinic if they have a problem.

As part of the clinic's protocols, clinicians were also expected to schedule at least one follow-up appointment for their clients. In the follow-up appointment, clinicians were to gain an overall impression of the HA performance, ask about various aspects of HA management and sound perception, and address any issues. It was then at the discretion of the clinician and client to 'finalise' on the HAs or book another follow-up appointment. 'Finalisation' was

when a client signed paperwork to confirm their purchase of the HAs and signifying the end of the trial period. An unlimited number of further appointments could still be arranged after finalization but HAs could no longer be returned for a refund. Clinicians documented the number of visits during the HA trial (from the fitting to the finalization appointment) and the average daily hours of HA usage on the Clinician HA Information form (Appendix 4). The consent form, Pre-fitting Questionnaire, and Clinician HA Information form were then mailed to the researcher.

Post-fitting questionnaires were to be completed 12 weeks after the HA fitting appointment. McLeod & Upfold (2003) concluded that the SADL must be administered at least 3 months after the HA fitting or else long-term satisfaction will be overestimated. Therefore, questionnaires were to be mailed to participants 10.5 weeks after the fitting appointment with the intention that they arrived 11 weeks post-fitting. They were instructed to complete it within one week. If questionnaires were not received back within two weeks of being mailed out, participants were contacted via telephone to enquire if they had received the questionnaires and were still able to complete them.

2.5 Statistical analyses

The study design is a non-intervention descriptive cross-sectional survey design study using parametric statistical analyses. The IBM Statistical Package for the Social Sciences (SPSS) Version 20 was used for statistical analysis. Descriptive statistics were completed to obtain the following for each continuous variable: mean, minimum, maximum, standard deviation, skewness, and kurtosis. Pearson product-moment correlations were used to describe the relationship between the following independent continuous variables and SADL scores: years of HA experience, BEPTA and WEPTA, hearing ability, change in hearing ability, hearing handicap, communication self-efficacy, change in self-efficacy, HA self-

efficacy, average daily hours of usage, and number of appointments. This correlational analysis was suited to this research as it determined the amount of variance each independent variable accounted for in the outcome variable. Correlational analysis was to be followed by discriminant analysis. Discriminant analysis would determine which variables could be used to classify the SADL groups (below, within, or above norms). This study did not attempt to determine cause and effect relationships.

For the non-continuous variables (gender and HA experience), descriptive statistics were completed to obtain frequencies. Separate analyses were run for each level of the non-continuous variables. One-way ANOVA testing was run to determine any significant differences for non-continuous variables.

Chapter Three: Results

3.1 Sample Characteristics

A total of 168 clients who met the study's inclusion and exclusion criteria were invited to participate in this study. Fifty-nine clients returned consent forms by the cut-off time point. Pre-fitting data were obtained for 57 participants. Two participants dropped out of this study as they returned their hearing aids. Following preliminary analysis of z scores (to examine for skewness and kurtosis) and box plots, four outliers were removed from this study. Of the remaining adults who completed Pre-fitting Questionnaire, 47 adults returned the Post-fitting Questionnaire. Therefore, full data sets were obtained for 47 participants.

Although post-fitting questionnaires were meant to be sent out 10.5 weeks after the fitting date, questionnaires were mailed between 9.6 weeks and 15.6 with a mean time of 10.7 weeks after fitting. Some questionnaires had to be mailed early due to a public holiday period where mail could not be sent. Three questionnaires were sent out significantly later than the others as participant consent forms and contact information sheets were not passed on to the researcher until more than 10.5 weeks post-fitting. The average time that questionnaires were sent out without these three outliers was 10.5 weeks.

3.1.1 Demographic characteristics

Participants included 14 females and 33 males. Age ranged from 46 to 92 years with the mean age being 71 years (SD = 9.668). Forty-four participants were native English speakers; the first language of the three other participants was Vietnamese, Māori, and Samoan.

3.1.2 Audiologic characteristics

This sample included 27 experienced HA users and 20 first-time users. Forty-two participants were fit bilaterally, four were fit unilaterally, and one was fit with a CROS (Contralateral Routing of Signal) HA. The average HI of all participants is shown in Figure 3.1.

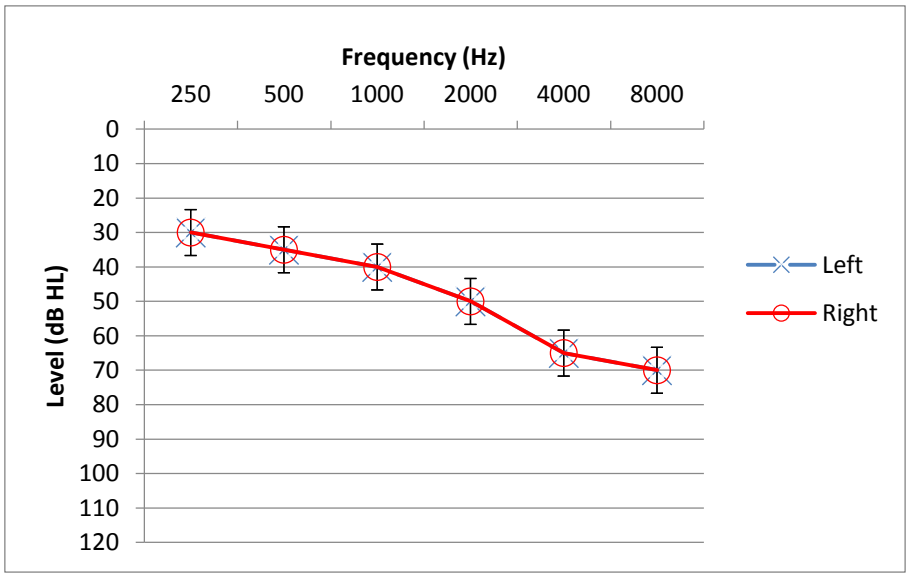

Figure 3.1. **Mean right and left ear air conduction thresholds of participants.**

3.2 Descriptive Statistics of Continuous Variables

Table 3.1 shows the descriptive statistics for the continuous variables of this study. Not all participants' data were able to be included in the analysis of each variable for various reasons. One participant was excluded from the analysis of both SESMQ scores as he/she did not correctly circle answers from the available options and was not able to hear the researcher ask the questions when contacted via telephone. Another participant was excluded from the self-efficacy scale of the SESMQ as only 11 of the 20 questions were answered. Finally, the average number of hours of use was not able to be recorded for one participant who finalized on the HAs at the fitting appointment as he/she was simply getting a HA to replace a lost one.

Analysis of z-scores revealed that there was skewness and kurtosis ($z > 1.96$) for four continuous variables: age, years of HA experience, SESMQ hearing ability scores, and number of appointments.

***Table 3.1*. Descriptive statistics of continuous variables.**

	N	Minimum	Maximum	Mean	SD
Age	47	46	92	71.15	9.67
Years of experience	27	.5	20	8.09	4.66
Pre-fit SESMQ-HA	46	20.00	173.50	72.76	29.45
Pre-fit SESMQ-SE	45	19.00	173.00	81.34	32.12
HHQ	47	12.50	81.25	46.54	17.08
BEPTA	47	16.25	67.50	41.76	13.12
WEPTA	47	26.25	87.50	51.78	15.22
Change in SESMQ-HA	47	56.00	189.00	116.95	38.71
Change in SESMQ-SE	47	52.00	187.00	123.64	38.16
MARS-HA Factor1	47	38.89	100.00	78.42	16.21
MARS-HA Factor 2	47	54.29	100.00	89.86	12.53
MARS-HA Factor 3	47	53.33	100.00	87.59	13.77
MARS-HA Factor 4	47	2.00	100.00	74.04	22.91
MARS-HA Total	47	56.25	99.17	81.91	12.07
Number of Appointments	47	1	6	2.77	1.01
Average hours of use	47	.0	15.0	9.56	3.34
Valid N (listwise)	45				

3.3 Hypotheses

3.3.1 Hypothesis 1

Cox & Alexander (1999) developed a normative range for the SADL scales; in other words, 95% of the population fell within this range, 2.5% fell below the range, and 2.5% fell above the range. Thus, hypothesis 1a states that at least 97.5% of participants would also fall within or above these SADL norms. Figures 3.2 to 3.6 show the number of participants in this current study who fell below, within, and above the normative ranges. Figure 3.2 illustrates the ratio of adopters who scored below, within and above the normative range of 4.3 to 5.6 on the Global scale of the SADL questionnaire. Only 91.5% of participants fell within or above the normative range.

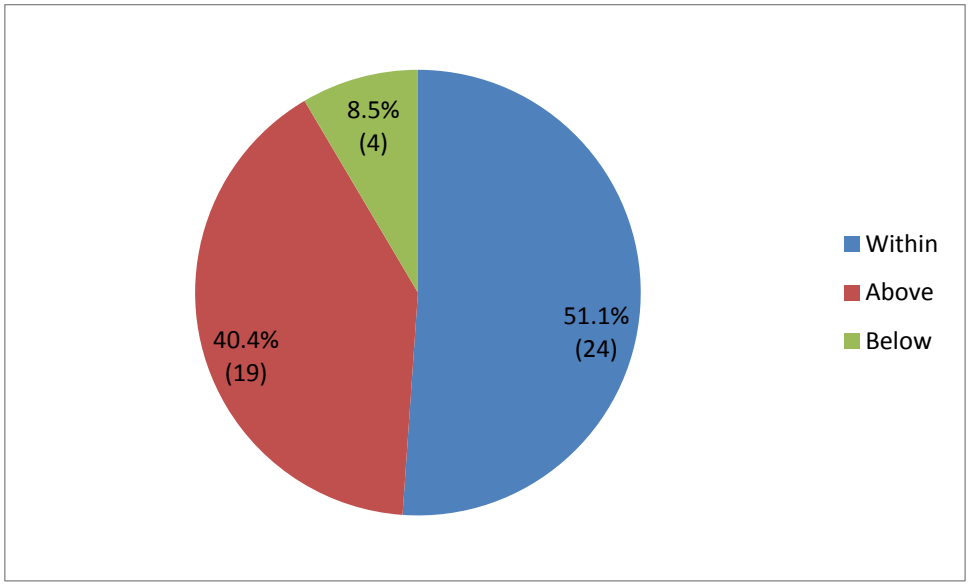

Figure 3.2. **SADL Global scores compared to norms by Cox & Alexander (1999).**

Figure 3.3 illustrates the ratio of participants who scored below, within and above the normative range of 3.8 to 6.1 in the Positive Effect section. It can be seen that 91.5% participants fell within or above this subscale's norms.

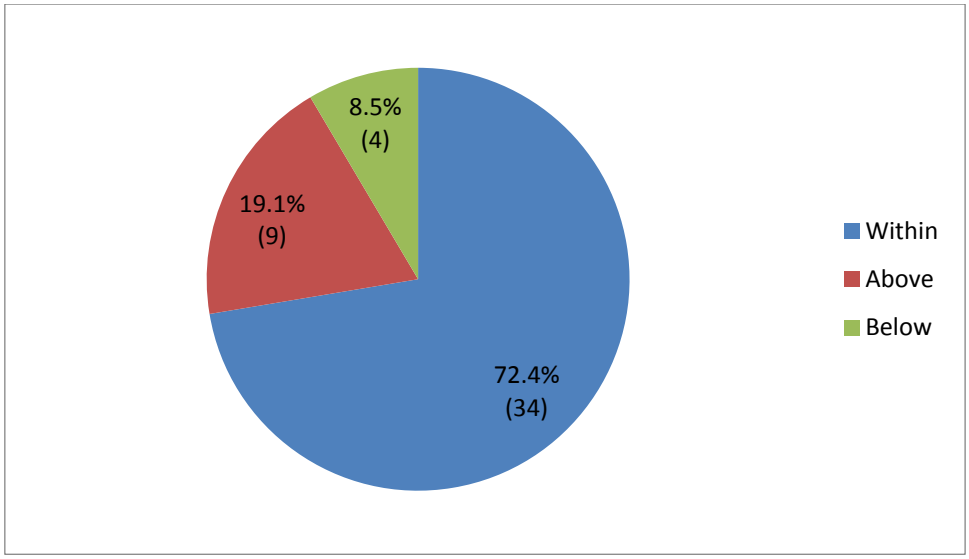

Figure 3.3. **SADL Positive Effect scores compared to norms by Cox & Alexander (1999).**

Figure 3.4 shows the proportion of participants who scored below, within and above the normative range of 4.0 to 5.7 in the Service and Cost subscale. For this subscale, 76.6% fell within or above the normative range.

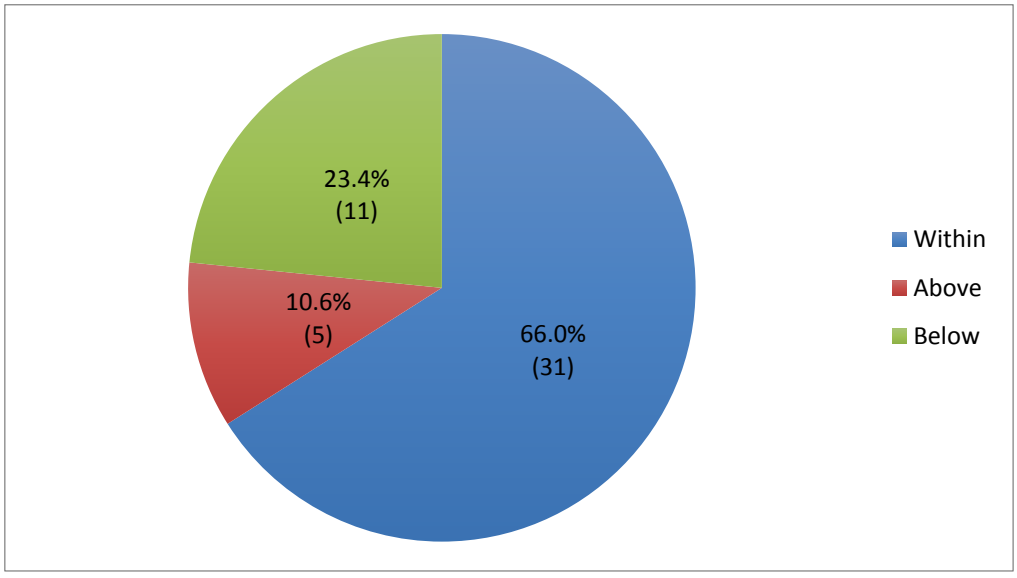

Figure 3.4. **SADL Service and Cost scores compared to norms by Cox & Alexander (1999).**

Figure 3.5 reveals the proportion of participants who scored below, within and above the normative range of 2.3 to 5.0 in the Negative Features subscale. It can be seen that 95.7% fell within of above the normative range for this subscale.

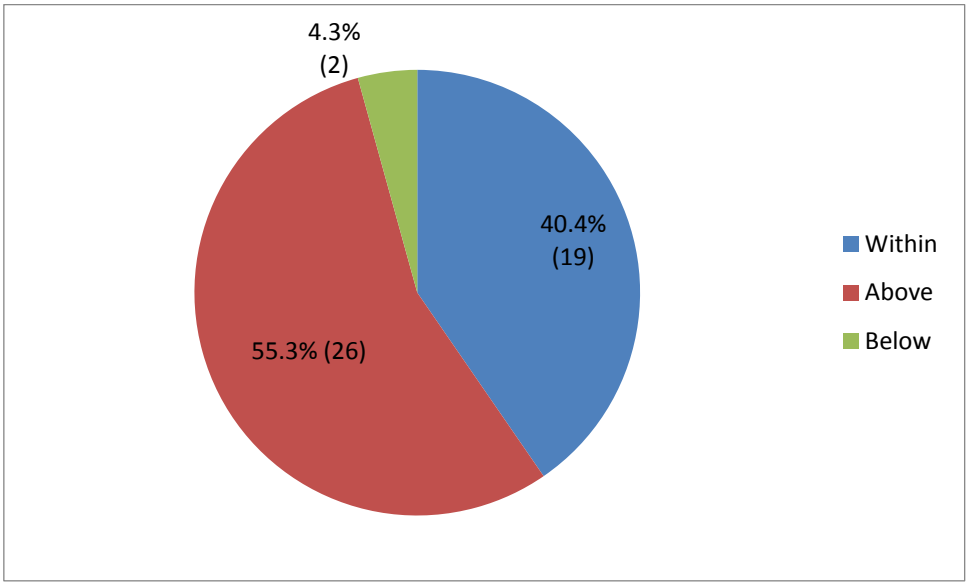

Figure 3.5. **SADL Negative Features scores compared to norms by Cox & Alexander (1999).**

Figure 3.6 shows the ratio of participants who scored below, within and above the normative range of 5.0 to 6.7 in the Personal Image subscale. For this subscale, 83% of participants fell within or above the norms. Thus, hypothesis 1a was not supported as less than 97.5% participants fell within or above the norms for all SADL scales.

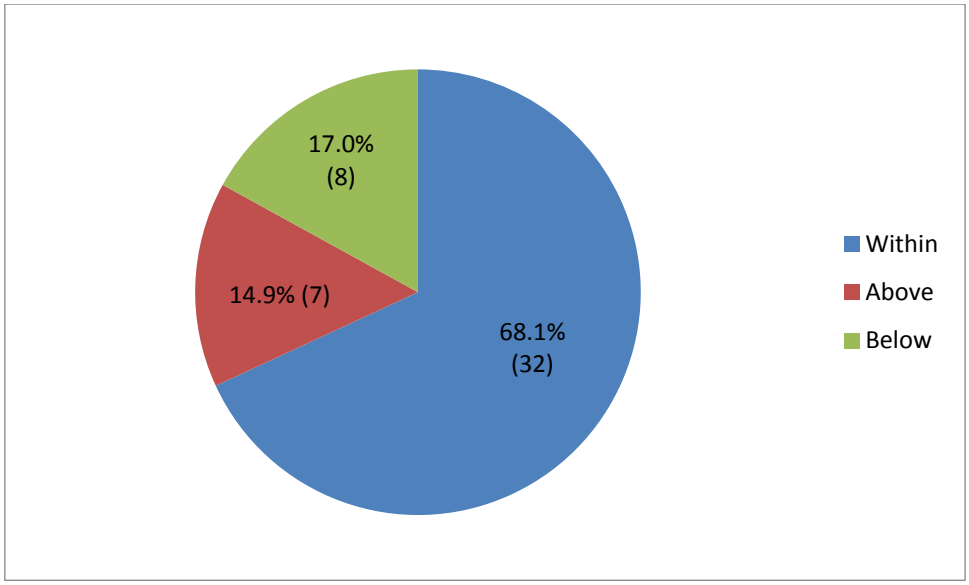

Figure 3.6. **SADL Personal Image scores compared to norms by Cox & Alexander (1999).**

Hypothesis 1b states that mean SADL scores will be higher in this study compared to the mean scores established by Cox & Alexander (1999). Hypothesis 1c states that mean SADL scores of this study will be comparable to more recent findings such as those found by Kaplan-Neeman et al. (2012) and Uriarte et al. (2005). As seen in Table 3.2, the average SADL Global score from this study was 5.28 (SD = 0.73). Table 3.3 compares the mean SADL scores from this study with the scores of the other three studies. This study's mean global score was higher than the mean score of the other three studies. Comparison of the data from the four studies seems to show that overall satisfaction has gradually increased over time. In particular, satisfaction with negative features has increased dramatically since Cox and Alexander's findings in 1999. On the other hand, satisfaction with Service and Cost was lower in this study compared to the other research. Satisfaction with Positive Effect and Personal Image was higher for this study compared to the average established by Cox & Alexander (1999) but are comparable to the two recent studies. Not enough information was

available to allow statistical comparison of the results from the various studies but it appears that Hypothesis 1 (b and c) was supported.

Table 3.2. **Descriptive statistics for SADL scales in the present study.**

SADL Score	N	Minimum	Maximum	Mean	SD
Global	47	3.00	6.47	5.28	.72
Positive Effect	47	2.50	6.83	5.25	.97
Service and Cost	47	2.67	7.00	4.72	1.03
Negative Features	47	2.00	7.00	5.31	1.17
Personal Image	47	2.00	7.00	5.81	1.16

Table 3.3. **SADL scale means across studies.**

Mean SADL Scores	Present study (N = 47)	Cox & Alexander (1999) (N = 257)	Uriarte et al. (2005) (N = 1014)	Kaplan-Neeman et al. (2012) (N = 109)
Global	5.28	4.9	5.27	5.12
Positive Effect	5.25	4.9	4.98	5.3
Service and Cost	4.72	5.4	5.70	5.28
Negative Features	5.31	3.6	4.74	3.9
Personal Image	5.81	5.6	5.86	5.83
Demographics				
Mean age (years)	71.2	NR*	75.3	65.2
Males (%)	70.2	NR*	54.4	64.2
Binaural Fit (%)	89.4	NR*	54.8	59

**NR = not reported.*

3.3.2 Hypothesis 2

Hypothesis 2 states that a relationship will not be found between age and SADL scores. However age was significantly correlated with the Global scale (r = .384, p = .008) and Negative Features subscale (r = .359, p = .013) (Table 3.4). This was a positive correlation meaning that as age increases so did satisfaction scores. The r^2 values indicate that 14.7% of the variance in the Global scores and 12.8% of the variance in Negative Features scores is explained by age. Therefore, this hypothesis was not supported.

Table 3.4. **Pearson correlation results for age versus SADL scores.**

Age	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	.243	.237	.359*	.284	.384**
Sig. (2-tailed)	.100	.109	.013	.053	.008
N	47	47	47	47	47

* p < .05 ** p < .01

3.3.3 Hypothesis 3

Hypothesis 3 states that gender will not relate to satisfaction. However, one-way ANOVA revealed a significant gender difference (Table 3.5). Females were more satisfied with personal image and stigma of HAs compared to males (F (1, 45) = 5.603, p = .022). Therefore, this hypothesis was not supported.

***Table 3.5*. One-way ANOVA results for male versus female participants for SADL scores.**

		Sum of Squares	df	Mean Square	F	Sig.
SADL Positive Effect	Between Groups	.291	1	.291	.304	.584
	Within Groups	43.146	45	.959		
	Total	43.437	46			
SADL Service and Cost	Between Groups	.077	1	.077	.072	.790
	Within Groups	48.660	45	1.081		
	Total	48.738	46			
SADL Negative Features	Between Groups	.060	1	.060	.043	.836
	Within Groups	62.735	45	1.394		
	Total	62.796	46			
SADL Personal Image	Between Groups	6.891	1	6.891	5.603	.022
	Within Groups	55.349	45	1.230		
	Total	62.240	46			
SADL Global	Between Groups	.571	1	.571	1.092	.302
	Within Groups	23.531	45	.523		
	Total	24.102	46			

3.3.2 Hypothesis 4

The fourth hypothesis states: a) HA satisfaction will be higher among experienced HA users compared to new users; and b) years of HA experience will positively relate to

satisfaction. Analysis of data via one-way ANOVA also revealed no significant difference between experienced and non-experienced users on any of the SADL scores (Table 3.6). Pearson correlation analysis revealed no significant relationship between increasing years of experience and any SADL scores ($p > .05$) (Table 3.7). Therefore, Hypothesis 4 was not supported.

***Table 3.6*. One-way ANOVA results for experienced versus non-experienced users for SADL scores.**

		Sum of Squares	df	Mean Square	F	Sig.
SADL Positive Effect	Between Groups	.093	1	.093	.097	.757
	Within Groups	43.344	45	.963		
	Total	43.437	46			
SADL Service and Cost	Between Groups	.042	1	.042	.039	.844
	Within Groups	48.695	45	1.082		
	Total	48.738	46			
SADL Negative Features	Between Groups	.447	1	.447	.323	.573
	Within Groups	62.349	45	1.386		
	Total	62.796	46			
SADL Personal Image	Between Groups	.271	1	.271	.197	.659
	Within Groups	61.969	45	1.377		
	Total	62.240	46			
SADL Global	Between Groups	.003	1	.003	.005	.945
	Within Groups	24.099	45	.536		
	Total	24.102	46			

Table 3.7. **Pearson correlation results for years of experience versus SADL scores.**

Years of Experience	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	.076	.030	-.104	.032	.011
Sig. (2-tailed)	.610	.843	.487	.832	.940
N	47	47	47	47	47

3.3.4 Hypothesis 5

Hypothesis 5 states that HI severity will relate to satisfaction. However as seen in Table 3.8, Pearson correlations found neither better ear or worse ear PTA (BEPTA and WEPTA) significantly related to SADL scores ($p > .05$).

Table 3.8. **Pearson correlation results for BEPTA and WEPTA versus SADL scores.**

		SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
BEPTA	Pearson Correlation	.233	-.009	-.110	-.101	.036
	Sig. (2-tailed)	.116	.953	.460	.500	.812
	N	47	47	47	47	47
WEPTA	Pearson Correlation	.090	-.141	-.136	.124	.003
	Sig. (2-tailed)	.548	.343	.363	.407	.983
	N	47	47	47	47	47

3.3.5 Hypothesis 6

Hypothesis 6a) states that pre-fitting hearing ability will relate to HA satisfaction. Pre-fitting hearing ability, as measured by the SESMQ in the Pre-fitting Questionnaire, was not found to significantly relate to the any of the SADL subscales ($p > .05$) (Table 3.9).

Hypothesis 6b) states that change in hearing ability will relate to HA satisfaction. Change in HA ability (as measured by the difference between pre- and post-fitting SESMQ scores) was significantly related to Negative Features, Personal Image and Global scores as seen in Table 3.10. The r^2 values indicated that14%, 13%, and 14% of the variance of these respective scales was accounted for by hearing ability. All relationships were positive so greater change in hearing ability scores related to greater satisfaction levels.

Table 3.9. **Pearson correlation results for SESMQ Hearing Ability scale versus SADL scores.**

SESMQ Hearing Ability	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	.009	.281	.159	-.247	.044
Sig. (2-tailed)	.955	.059	.292	.099	.774
N	46	46	46	46	46

Table 3.10. **Pearson correlation results for change in SESMQ Hearing Ability scores versus SADL scores.**

Change in SESMQ Hearing Ability	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	.273	.013	.385**	.373**	.377**
Sig. (2-tailed)	.064	.931	.008	.010	.009
N	47	47	47	47	47
r^2			.14	.13	.14

** $p < .01$

3.3.6 Hypothesis 7

Hypothesis 7 states that hearing handicap will relate to satisfaction. HHQ scores significantly related to the Service and Cost subscale ($r = -.379$, $p = .009$) (Table 3.11). These

variables shared 14% variance. A negative relationship was found so Service and Cost scores decreased as HHQ scores increased. Therefore, this hypothesis was supported.

Table 3.11. **Pearson correlation results for HHQ scores versus SADL scores.**

HHQ	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	-.004	-.379**	-.201	.034	-.147
Sig. (2-tailed)	.979	.009	.175	.818	.326
N	47	47	47	47	47

** p < .01

3.3.7 Hypothesis 8

Hypothesis 8 states that a) pre-fitting communication self-efficacy will relate to HA satisfaction and b) change in communication self-efficacy will relate to HA satisfaction. Table 3.12 shows that pre-fitting self-efficacy significantly related to Service and Cost scores (r = .316, p = .035) and accounted for 10% of the variance. Change in communication self-efficacy significantly related to the Positive Effect subscale, Personal Image subscale and Global scale (Table 3.13). It accounted for 11%, 12% and 12% of variance for those scales respectively. Relationships were positive so a larger change in communication self-efficacy scores related to greater satisfaction. Therefore, hypothesis 8 was supported.

Table 3.12. **Pearson correlation results for SESMQ Self Efficacy scale versus SADL scores.**

SESMQ-SE	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Peason Correlation	.034	.316*	.263	-.091	.148
Sig. (2-tailed)	.825	.035	.081	.553	.333
N	45	45	45	45	45

*p < .05

Table 3.13. **Pearson correlation results for change in SESMQ Self Efficacy scores versus SADL scores.**

Change in SESMQ-SE	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	.336*	-.057	.234	.351*	.349*
Sig. (2-tailed)	.021	.705	.114	.016	.016
N	47	47	47	47	47

* $p < .05$

3.3.8 Hypothesis 9

Hypothesis 9 states that self-efficacy with HAs will relate to HA satisfaction. MARS-HA Factor 1 (aided listening) scores significantly related to the Service and Cost subscale, the Negative Features subscale, and the Global score (Table 3.14). Relationships were positive so greater self-efficacy for aided listening related to greater satisfaction levels. Self-efficacy for aided listening accounted for 14%, 28%, and 19% variance of the respective SADL scales. MARS-HA Factor 2 (basic handling) related to Positive Effect, Service and Cost, and Global Satisfaction. Variance for Factor 2 was 9%, 14%, and 13% respectively. MARS-HA Factor 3 (adjustment) significantly related to Global satisfaction and all SADL subscales. Variance was relatively high (up to 38%). Relationships were positive so greater self-efficacy for adjustment to HAs (e.g. getting used to own voice) was related to greater SADL scores. MARS-HA Factor 4 (advanced squealing) was only significantly related to the Service and Cost subscale and it accounted for only 8% of the variance in these scores. Total MARS-HA scores were significantly related to Positive Effect, Service and Cost, Negative Features, and Global satisfaction. Variance for these scores was calculated to be between 14 and 25%.

Table 3.14. **Pearson correlation results for MARS-HA scores versus SADL scores.**

		SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
MARS-HA Factor 1	Pearson Correlation	.206	.370*	.530**	.186	.437**
	Sig. (2-tailed)	.164	.010	.000	.210	.002
	N	47	47	47	47	47
	r^2		.14	.28		.19
MARS-HA Factor 2	Pearson Correlation	.293*	.374**	.206	.277	.362*
	Sig. (2-tailed)	.046	.010	.165	.059	.012
	N	47	47	47	47	47
	r^2	.9	.14			.13
MARS-HA Factor 3	Pearson Correlation	.483**	.381**	.448**	.395**	.615**
	Sig. (2-tailed)	.001	.008	.002	.006	.000
	N	47	47	47	47	47
	r^2	.23	.15	.20	.13	.38
MARS-HA Factor 4	Pearson Correlation	.286	.290*	.061	-.042	.197
	Sig. (2-tailed)	.051	.048	.683	.778	.184
	N	47	47	47	47	47
	r^2		.09			
MARS-HA Total	Pearson Correlation	.376**	.482**	.419**	.215	.500**
	Sig. (2-tailed)	.009	.001	.003	.147	.000
	N	47	47	47	47	47
	r^2	.14	.18	.17		.25

* $p < .05$ ** $p < .01$

Overall, there were significant and positive relationships between HA self-efficacy and SADL scores thus Hypothesis 9 was supported.

3.3.9 Hypothesis 10

Hypothesis 10 states that average daily hours of usage (as measured by the data-logging feature of HAs) will correlate to greater satisfaction. However, Pearson's correlation analysis found no significant relationship ($p > .05$) (Table 3.15).

Table 3.15. **Pearson correlation results for average daily hours of use versus SADL scores.**

Average daily hours of use	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	.206	-.073	.033	-.107	.051
Sig. (2-tailed)	.165	.627	.824	.474	.734
N	47	47	47	47	47

3.3.10 Hypothesis 11

Hypothesis 11 states that fewer fitting appointments will relate to greater satisfaction but no significant relationship was found between these variables ($p > .05$).

Table 3.16. **Pearson correlation results for MARS-HA scores versus SADL scores.**

Number of appointments	SADL Positive Effect	SADL Service and Cost	SADL Negative Features	SADL Personal Image	SADL Global
Pearson Correlation	.061	.097	-.157	-.155	-.039
Sig. (2-tailed)	.685	.516	.292	.299	.795
N	47	47	47	47	47

Chapter Four: Discussion

This chapter discusses the study's findings. The first purpose of this research was to determine the HA satisfaction levels of a sample of New Zealand HA users and compare those results to previous findings. Second, this study investigated the relationships between client factors and HA satisfaction. The client factors were: age, gender, HA experience (new versus experienced), years of HA experience (among experienced users), HI severity, hearing ability, change in hearing ability, hearing handicap, communication self-efficacy, change in self-efficacy, HA self-efficacy, average daily hours of usage, and number of appointments.

4.1 Satisfaction Levels

This study detected high levels of satisfaction among participants in comparison to older research. Although it was hypothesised that 97.5% of participants would fall within or above the SADL norms, this percentage was not met. However, the majority of participants were within or above the ranges indicating there was still a high number of satisfied participants. Approximately 91% of participants were within or above the normative range for Global satisfaction. Table 3.3 found most mean SADL results were higher in this study compared to the norms outlined by Cox & Alexander (1999). Results from this study were mostly comparable to or higher than findings of Uriarte et al. (2005) and Kaplan-Neeman et al. (2012). However, the mean Service and Cost score was lower in this study compared to the other three studies. It is particularly concerning that 23.4% of participants fell below the norms for this subscale. The SADL contains a cost item: "Does the cost of your hearing aids seem reasonable to you?" The SADL online scoring guide suggests that this item be eliminated for participants who have not paid for the HAs and that the Service and Cost subscale score should be calculated from the two remaining items (Hearing Aid Research Lab, 2003). It was not eliminated from this study as most participants paid for a portion of

their HAs. Cox & Alexander (2001) found clients whose HAs were partially funded responded to the SADL questionnaire in a similar way to clients whose HAs were fully funded. Both groups tended to be more satisfied than private paying clients. This does not seem to be true in the present study. As reported in Table 3.3, the mean score for the Service and Cost subscale in this study was 4.72 (SD = 1.03) which was lower than the normative mean of 5.4 (SD = 1.2) (Cox & Alexander, 1999). The mean score for the cost item alone was 3.22 (SD = 1.744). If the cost item score was removed, the mean score for this subscale was 5.65 (SD = 1.041) which is higher than the norms. This new mean is more comparable to the results of Uriarte et al. (2005) who also deleted this item from their study as most participants did not pay for their hearing aids. In the study by Kaplan-Neeman et al. (2012), participants paid for their HAs but were reimbursed 10 to 50% of the cost by national and health maintenance organization authorities. The cost item was included in their study and they also found a low average score of 3.55. Thus HA satisfaction with cost may differ across countries depending on HA funding options although overall satisfaction levels are still comparable. It seems that the cost of HAs in New Zealand needs to be addressed in order to increase overall HA satisfaction.

The most noticeable improvement in SADL scores between this study and that of Cox and Alexander's norms is for the Negative Features subscale (Table 3.3). This subscale included item 2 on frustration regarding background noise, item 7 about insufficient gain due to feedback, and item 11 regarding helpfulness of HAs on telephones. Participants did not answer item 11 if they heard well on the telephone without HAs. It can be seen that average scores for each item were high (Table 4.1). Interestingly, these scores were high even compared to the recent findings of Kaplan-Neeman et al. (2012) who established respective mean scores of 3.7, 4.89, and 3.07. Therefore, it seems that HAs are rapidly improving in the reduction of negative features or the differences are due to variations in sample populations.

Similarly, Cox & Alexander (2001) noted a difference in satisfaction levels for this subscale only two years after the original norms were published. They suspected the use of compression processing (rather than linear processing) was the reason for this difference.

***Table 4.1*. Descriptive statistics for the items of the Negative Features subscale.**

	N	Minimum	Maximum	Mean	SD
Item 2	46	1.00	7.00	4.804	1.881
Item 7	46	2.00	8.00	6.217	1.263
Item 11	31	1.00	7.00	4.387	1.585
Valid N (listwise)	29				

There are many differences across the studies compared in Table 3.3. Firstly, satisfaction was measured at different post-fitting times. Cox & Alexander's results in 1999 were gathered at least 12 months post-fitting. Uriarte et al. (2005) gathered results 3 to 6 months post-fitting. Kaplan-Neeman et al. (2012) did not gather results at a specific time post-fitting but instead asked 177 adults who had been fitted across a timeframe (2006 to 2009) to complete the SADL. Only users who had been using their HAs for at least 3 months were invited to participate. The present study aimed to gather SADL results 12 weeks after their fitting session. A space for date of completion was placed in the Post-fitting Questionnaire but only 41 filled the date out or were able to provide a date when followed up via telephone. On average, the 41 participants filled out the questionnaire 12 weeks post-fitting but the range was 10 to 20 weeks. McLeod & Upfold (2003) examined how long it takes SADL subscale scores to stabilise to a point where they are not significantly different to scores at 12 months or more post-fitting. The latest time periods at which scores were significantly different ($p < .01$) to those at 52+ weeks were: 4 to 7 weeks for the Positive Effect subscale; 2 weeks for Negative Feature scores; 24 to 27 weeks for the Service and Cost subscale; 4 to 7 weeks for Global scores. There were no significant changes in Personal

Image scores over time indicating a person's attitude toward HA appearance and stigma does not change. Therefore, the differences in time of measurement should not be the cause of differences in study findings except perhaps for the Service and Cost subscale as all studies measured SADL scores after they had apparently stabilized.

Another noticeable difference between this present study and the other studies is the greater number of binaural fittings in this study. That being said, Kaplan-Neeman found binaural fittings to only be significantly associated with ratings in the Negative Features scale ($F = 10.16$; $p = .025$). Uriarte et al. (2005) found no effect of monaural versus binaural status on mean satisfaction scores.

It should be noted that the SADL was included in the Post-fitting Questionnaire after the SESMQ and the MARS-HA. Thus respondents were required to rate hearing ability and self-efficacy in various communication and HA situations prior to rating HA satisfaction. Completion of these questionnaires immediately prior to the SADL could have resulted in a carry-over effect, for example poor ratings on these situations could have resulted in poor SADL ratings.

Overall, it seems global satisfaction and satisfaction with various aspects of HAs has increased over the years. It is a reasonable theory that the increase in satisfaction relates to advances in HA technology such as noise reduction, directionality, multi-channel compression, and active feedback cancellation (Kaplan-Neeman et al., 2012). This theory is supported by the marked increase in Negative Features scores. Unfortunately, users continue to be less satisfied with the cost of HAs. It seems that differences in service delivery, funding options, and culture may also account for some of the variation in scores as increase in satisfaction does not always increase with time. As seen in Table 3.2, the mean Global satisfaction score of this present study is closer to the mean score of the study conducted in

Australia (Uriarte et al., 2005) compared to the more recent study conducted in Israel (Kaplan-Neeman et al., 2012).

4.2 Relationship Between Independent Variables and HA Satisfaction

4.2.1 Demographic factors

Contrary to the hypothesis, age related to satisfaction as measured by the SADL. There was a positive relationship between age and satisfaction with Negative Features. Kaplan-Neeman et al. (2012) found a negative relationship between age and Positive Effect and a positive relationship between age and Service and Cost. Mean age was 75.5 (SD = 11.9). The findings also differ from Hosford-Dunn & Halpern (2001) who identified a negative relationship between age and global satisfaction and positive effect. Mean age was 76.0 (12.8). Both these studies had a higher average age and slightly larger standard deviation compared to this study (mean = 71.2, SD = 9.668). This could explain why the relationships between age and Global satisfaction, Positive Effect and Service and Cost were not repeated. However it is surprising that this study then detected a relationship between age and Negative Features. It is possible that older adults in this study were aware of or used to the negative features of older HAs and so had lower expectations even of new HAs. Further research is needed to confirm these findings. This finding counters the research that found no relationship between age and satisfaction but which measured satisfaction via a generic single item. This study further indicates satisfaction measures like the SADL are more sensitive to various aspects of satisfaction compared to single-item questionnaires.

Gender was also not expected to relate to HA satisfaction as numerous studies have found no relationship between these variables. However, this study's findings indicated that females are more satisfied with appearance and self-image surrounding HAs. HAs are continually becoming smaller in size while maintaining the same or better technology. This

study had relatively few female participants therefore results should be interpreted with caution and again more research is needed to confirm the findings.

4.2.2 HA experience

Although it was hypothesised that experience would relate to HA satisfaction, previous research was divided on this relationship so this finding was not entirely unexpected. Studies that did find relationships had low correlation coefficients. The studies that found a relationship between length of experience and HA satisfaction were comparing very small amounts of HA experience (e.g. less than 6 weeks) to large amounts of experience (e.g. over 10 years) hence they may be more sensitive to changes in satisfaction due to experience (Hosford-Dunn & Halpern, 2001; Uriarte et al., 2005). The minimum, mean and maximum length of experience for experienced users are presented in Table 3.1. A small coefficient of variation (.576) indicates that distribution of this variable may not have been great enough to find significant results.

4.2.3 HI severity

Contrary to the previous research of Kaplan-Neeman et al. (2012), Uriarte et al. (2005), Hosford-Dunn & Halpern (2001), and Dillon et al. (1999), HI severity did not relate to any of the SADL scales. In this study, coefficients of variation for BEPTA and WEPTA were small, 0.314 and 0.294 respectively, indicating that the variation of the sample may not have been great enough to establish a relationship. However, the variance in the aforementioned studies was low signifying that HI severity accounted for very little of the variance in satisfaction scores. Furthermore, many studies have found no such relationship between these variables although these studies used a single-item measure of satisfaction which may be less sensitive to a relationship between variables (Gatehouse, 1994; Brooks & Hallam, 1998; Cox et al., 2007; Jerram & Purdy, 2001; Hickson et al., 1999; Scherr et al., 1983; Hutton & Canahl, 1985; Bentler et al., 1993; Norman et al., 1994; Dillon et al., 1997).

It is not entirely unexpected that there was no relationship between HI severity and satisfaction given that degree of HI has been noted to account for less than half of perceived handicap (Ventry & Weinstein, 1982). Other research also notes that the experience and impact of HI is personal and cannot be predicted by audiometric thresholds (Swan & Gatehouse, 1990). This indicates that hearing ability may be more influential on HA satisfaction.

4.2.4 Hearing ability

The average SESMQ hearing ability score of 72.761 (SD = 29.452) was lower than the mean score of 92.6 (SD = 37.1) found by Jennings et al. (2013). The study by Jennings et al. (2013) was conducted in Canada and Australia. Their sample consisted of 338 adults aged 50 years or more (mean age = 73.8) with acquired HI (regardless of whether they are HA users). Acquired HI was not an inclusion or exclusion criteria for the present study. Although the average age of the present study's sample was 71.15 (SD = 9.668), the youngest participant was 46. Modality of measurement was also different between studies. In the study by Jennings et al. (2013), the audiologist personally administered the questionnaire and participants had the opportunity to ask questions. Jennings et al. (2013) believed the questionnaire could be completed orally or in a paper-and-pencil modality. However completing it orally with an audiologist could cause respondents to give more pleasing answers.

Results from this study indicated that hearing ability prior to HA fittings was not influential in achieving satisfaction with HAs as pre-fitting SESMQ hearing ability scores did not significantly relate to any of the SADL scores. This result differed from the findings of Uriarte et al. (2005) and Hosford-Dunn & Halpern (2001) who found greater unaided hearing difficulty related to increased SADL scores. As previously noted, both studies measured hearing ability via a single item as opposed to via a questionnaire which investigates various

hearing situations. Although the pre-fitting SESMQ in this study assessed hearing ability prior to the fitting of HAs, it was not specified to respondents who already wore HAs to respond based on their unaided hearing ability. Therefore, they were reporting on their *current* hearing ability as opposed to their unaided hearing ability which may also account for the differences in findings.

Change in hearing ability was noted to positively and significantly relate to three SADL scores: Negative Features, Personal Image, and Global satisfaction. No other research was identified to consider change in hearing ability as a variable however it is not surprising that it had a positive effect on satisfaction given the general aim of HAs is to improve hearing ability.

4.2.5 Hearing handicap

Within the Pre-fitting Questionnaire, the HHQ was placed after the SESMQ which of course measures ability or conversely disability in various situations. Gatehouse & Noble (2004) argue that the handicap scale should be administered completely independently of a disability questionnaire (e.g. before the participant visits the clinic) so that the disability questionnaire does not skew results. However, the mean HHQ score, 46.54 (SD = 17.08), was similar to the average score of 49.0 (SD = 23.9) established by Gatehouse & Noble (2004). A lower score indicates lesser handicap. Results from this present study indicate that greater hearing handicap related to lower satisfaction with Service and Cost of HAs. Perhaps, those with greater handicap have greater HA expectations or needs regarding the fitting, reliability and cost or value of HAs and these are not being met. No research was identified comparing hearing handicap to satisfaction. This result is inconsistent with the findings of Laplante-Levesque et al. (2012) who found greater hearing handicap was associated with more successful HA outcomes.

4.2.6 Self Efficacy

The mean SESMQ self-efficacy score was 81.344 (SD = 32.123) versus the mean of 123.0 (SD = 37.9) established by Jennings et al. (2013). The variations in study sample and design discussed above in relation to the SESMQ hearing ability scores apply to the differences in these scores too. People with higher communication self-efficacy are less likely to obtain HAs according to Laplante-Lévesque et al. (2012). Thus it was surprising that greater communication self-efficacy related to greater satisfaction with service and cost. Perhaps adults who have strong beliefs in their capabilities are able to take the actions needed to achieve a successful fitting. Change in communication self-efficacy related to satisfaction with personal image and global satisfaction. Again, users with increased self-efficacy could perhaps incite the motivation to overcome any issues with self-image. It is promising that self-efficacy can change in a positive way following the fitting of HAs. As there is a relationship between perceived communication self-efficacy and HA satisfaction, it is recommended that clients be educated about a range of strategies to manage difficult communication situations as this further promotes self-efficacy (Jennings et al., 2013). It may also be useful to utilise the SESMQ as a pre-intervention questionnaire to guide rehabilitation decision-making and improve HA satisfaction. Rehabilitation goals could be based on specific situations of the SESMQ in which respondents demonstrate low levels of self-efficacy (Jennings et al., 2013).

Table 4.2 compares the mean MARS-HA scores of this study compared to West & Smith (2007). Average scores are fairly comparable between the two studies. The mean score for Factor 3 (adjustment to HAs) was slightly higher in the present study. Otherwise, the scores were slightly higher in West & Smith's study. West & Smith's sample only included males as participants were recruited from a Veterans Affairs medical centre. Similar to this

study, the MARS-HA could be completed in clinic or at home (returned via post). Smith & West (2006) suggest scores should be above 80% for optimal HA performance.

Table 4.2. **Mean MARS-HA scores from the current study and the study by West & Smith (2007).**

Mean MARS-HA scores	Present study (N = 47)		West & Smith (2007	
	Mean	SD	Mean	SD
Factor1	78.422	16.208	83.4	16.9
Factor 2	89.857	12.527	93.8	10.4
Factor 3	87.589	13.774	84.7	15.4
Factor 4	74.036	22.911	63.4	25.8
Total	81.912	12.071	82.4	13.0

As hypothesised, HA self-efficacy related to satisfaction in many ways. Self-efficacy for handling of HAs (MARS-HA Factor 2) related to Positive Effect, Service & Cost, and Global satisfaction. In other words, the client's belief that they can successfully manage their HAs related to overall satisfaction and satisfaction with HA performance and benefit, dispenser competency, HA cost, and product dependability. This is consistent with previous research that found self-efficacy for HA management related to successful outcomes (Meyer et al., 2014; Lovelock et al., 2014). One of the Service and Cost questions is regarding HA fitter's competence. Clients who have been treated by clinicians who spend time counselling them on HA management may possess greater self-efficacy for this aspect of HAs and may also have greater satisfaction with service delivery. It is difficult to know why self-efficacy for HA management specifically related to HA benefit but it was also a factor in overall

satisfaction. Therefore, time should be set aside during the HA fitting process to ensure clients feel capable and confident regarding the care and handling of their HAs.

There is very little research on the relationship between HA self-efficacy and satisfaction so further research is needed to confirm the other newly discovered relationships. Self-efficacy in aided listening situations (Factor 1) related to Service and cost, Negative Features, and Global scores. This portion of the questionnaire is similar to the SESMQ in that it investigates various communication and listening environments. Therefore, it is consistent that they both relate to satisfaction with HA service, cost, and dependability. A possible limitation of this factor is its wording. For this factor, respondents were asked how certain they were they could understand in certain situations. Respondents may answer based on their actual ability as opposed to their self-efficacy of their abilities. Indeed, West & Smith (2007) reported they selected the wording "can do" or "could do" because they are judgments of capability. However, capability is different from belief in capability. Meyer et al. (2014) also felt the MARS-HA inferred prior HA experience and so modified the minimum word anchor from "cannot do this at all" to "certain cannot do."

Factor 3 of the MARS-HA significantly related to all satisfaction scales. Thus the respondent's belief that they can adjust or "get used" to the sound and physical feel of their HA is very important for all aspects of HA satisfaction. Both adjustment to HAs and self-efficacy regarding HA adjustment have undergone little research. Clearly, this is an area worthy of further investigation as clinicians can provide counselling to increase self-efficacy for HA adjustment. Counselling could include expectations of what the client will hear with HAs and how things may sound very loud. To further help clients with HA adjustments, suggestions such as the following could be made: a) try to wear HAs every day and in a variety of listening environments, b) take breaks as needed if they feel overwhelmed by wearing HAs, c) persist with wearing HAs in order to allow time to adjust.

Advanced handling (MARS-HA Factor 4) significantly related to satisfaction with service and cost. It makes sense that a client would not be satisfied with cost and dependability of their HAs if they struggled with advanced handling of their HAs. For example, a client would likely be more satisfied with a HA if they were confident they could troubleshoot it when it stopped working. Again, this relationship may be because clients are satisfied with the competency of the clinician who may have taken the required time to increase self-efficacy for advanced handling.

Overall HA self-efficacy (total MARS-HA score) was significantly related to Positive Effect, Negative Features and Global satisfaction.

4.2.7 Average daily hours of HA use

This study found no significant relationship between the average hours of daily HA use contrary to the findings of numerous studies (e.g. Kaplan-Neeman et al., 2012; Uriarte et al., 2005; Bertoli et al., 2009; Jerram & Purdy, 2001). These studies measured daily HA usage by asking participants a question with fixed choices, e.g. 1 to 4 hours per day, 4 to 8 hours per day, and 8 to 16 hours per day). Research has found self-report measures of HA use to be inaccurate with respondents often overestimating or sometimes underestimating use time (Humes, Halling, & Coughlin, 1996; Taubman et al., 1999; Maki-Torkko, Sorri, & Laukli, 2001). This study on the other hand objectively measured each person's average hours of daily usage via the data-logging feature on the HAs. This study also had a smaller sample size compared to the others. Hence this study may have been less sensitive to effects of use time on HA satisfaction. It should be remembered clients can be satisfied with their HAs even though they only use them for small amounts of time (Kochkin, 1997b; Dillon et al., 1999).

4.2.8 Number of appointments

Contrary to the findings of Kochkin et al. (2010), this study found no significant relationship between number of appointments and HA satisfaction. Kochkin et al. (2010) measured number of visits via participant report which again may not be accurate. This study supports the findings of Hosford-Dunn & Halpern (2001) who found no significant relationship between total visits or total time (sum of clinical appointments in minutes) and any of the SADL scores. It should be remembered that four participants were removed from this study as they were outliers for this variable and this may have affected the results.

4.3 Clinical Implications

The findings of this study have clinical implications for audiological practice. The majority of clients (91.5%) were within or above SADL norms. Thus clinicians can be assured that they are providing predominantly satisfactory HA fittings. However 8.5% of clients fell below the SADL norms. The knowledge that these clients are not comparatively satisfied is useful for clinicians as this can lead to more effective management. For example, one participant who fell below the norms for global satisfaction only scored low on the personal image scale. If the clinician knew this was an issue, extra care could have been taken to find aids that were discreet and overall satisfaction could perhaps have been attained.

The SADL is a particularly useful tool as it determines the specific aspects which the client may be satisfied or unsatisfied with. It provides information that a single-item satisfaction rating does not acquire. For example, Uriarte et al. (2005) found a single-item satisfaction scale correlated with all four SADL subscales but only weakly with the Service and Cost and Personal Image subscales. This indicates that respondents did not consider issues relating to service provision and self-image as much as communication benefits and negative features when rating satisfaction on a single item. On the other hand, the SADL may

not have captured dissatisfaction among some clients. Cox & Alexander (2001) described a participant who presented with a Global score of 4.73 yet reported being "very dissatisfied" on an overall single-item satisfaction measure. This person found the HA to be a poor physical fit. Therefore, clinically it may be useful to investigate satisfaction with both measures.

Many outcome measures are clinically useful so it is at the discretion of the clinician to determine what is most important. Saunders & Jutai (2004) compared four outcome measures: 1) a generic measure called the Psychosocial Impact of Assistive Devices Scale (PIADS; Day & Jutai, 1996); 2) Abbreviated Profile of Hearing Aid Benefit (APHAB; Cox & Alexander, 1995); 3) Expected Consequences of Hearing Aid Ownership (ECHO; Cox & Alexander, 2000); and 4) the SADL (Cox & Alexander, 1999). It was found that each measure had a different clinical application so a measure should be chosen depending on the desired information. The SADL, which measures satisfaction with HAs, was the most useful when trying to understand specific issues a HA user may have with the concept of amplification and HAs.

As discussed in the first chapter, outcome measurement is useful at the service level. It was noted that it can be used to demonstrate treatment-efficacy, provide evidence for third-party payment, carry out cost-benefit analysis, and justify allocation of resources (Saunders et al., 2005). SADL results of this study show that treatment is satisfactory and so presumably effective indicating that third-party payment of HAs is justified and appropriate resources should continue to be provided to individuals with HI. Satisfaction with cost is low but overall satisfaction ratings are high so it is likely that benefit outweighs cost but further investigation is required. The SADL could be used to ensure clinics are providing satisfactory service to clients. If clinics are not achieving acceptable levels of satisfaction, the procedures

and policies of this centre and the practices of individual clinicians could be reviewed (Uriarte et al., 2005).

This study found both communication and HA self-efficacy are important in terms of HA satisfaction. If having difficulty achieving HA satisfaction for a client, the clinician could use self-efficacy measures such as the MARS-HA or SEMSQ to identify certain skills or listening situations in which the client is less confident. Resources could then be spent increasing confidence for those skills via counselling, role-playing, or even special self-efficacy training programs. To improve HA self-efficacy, written materials which comply with health literacy standards could be provided about HAs, modifications to HAs could be made to ensure easier management (e.g. clear identification of right versus left HAs), and family could be involved when providing information about HA care (Hickson et al., 2014). It is also important to ensure that hearing ability is maximally increased with HAs in order to achieve satisfaction. Therefore, it is important to assess the situations in which a person needs to hear and ensure HAs are able to provide the amplification and signal processing necessary to hear in those situations.

4.4 Limitations

This study has numerous limitations. First of all, the sample size was smaller (N = 47) than required according to *a priori* calculations (N = 85). Thus, statistical power was insufficient to effectively confirm or reject the findings of previous research. Variance in this study was low. The only independent variable that was found to account for more than 30% variance on SADL scores was the MARS-HA Factor 3 which accounted for 38% of the variance in Global scores. Another statistical limitation of this study was unsuccessful discriminant analysis. Discriminant analysis was attempted to identify which variables could be used to classify participants into SADL groups (below, within, and above norms).

However, in each analysis, either the prior probability was too high or the cross validation of the model did not meet the 25% *by chance accuracy* rate. Prior probability refers to the probability of a participant being classified into a certain group (below SADL normative range vs. within or above) simply by chance. It is related to the distribution of cases within groups. In the case of this study, most participants were in the "within norms" or "above norms" group. The 25% *by chance accuracy* criterion is a way to demonstrate the value of a model. For a model to be considered accurate and valuable, the proportion of cross-validated cases (classification of cases using the model but leaving one case out at a time) correctly classified by the model should be at least 25% greater than the proportional *by chance accuracy* (which is the summed squares of the prior probability). Even when SADL categories were changed to a binary variable (below norms versus within or above norms), discriminant analysis indicated that the variables obtained in this study could not accurately predict SADL outcomes for this sample of participants. Due to the nature of the study's design, the relationships between variables found were only descriptive and correlational rather than causal. For example, it is only known that change in hearing ability relates to satisfaction with negative features. It is unknown if a) increased hearing ability leads to greater satisfaction with negative features because those with greater hearing ability are more accepting of negative features; or b) reduced negative features (and consequent increased satisfaction) leads to increased hearing ability. More research would be beneficial to further explore the cause and effect of these relationships.

There are also many limitations with study design. Data was gathered by multiple clinicians from several clinics. Collection from a clinical rather than a research environment may lead to more clinically applicable findings. However the recruitment process could not be monitored to ensure all participants eligible to participate in the study were invited. Variations in service delivery could also affect results in uncontrolled ways. For example,

counselling of clients through the HA adoption process may vary dramatically between clinicians and it is unknown if this may have affected satisfaction levels. Furthermore, the time at which the questionnaires were completed and/or collected could not be strictly controlled. Even though Pre-fitting Questionnaires were meant to be completed prior to the HA fitting session, questionnaires were still collected regardless of when they were completed in order to gather enough data for this thesis. Thus some questionnaires may have been completed after HAs had been acquired in which case the measures would not have been examining pre-fitting performance.

Data was collected from nine clinics (seven North Island and two South Island) in New Zealand. There were high numbers of clients from certain clinics who declined the invitation to participate in this study. The reasons for declining participation are unknown but it may have been partially related to socioeconomic levels. Indeed, 35 of 36 invited participants declined to participate in a clinic based in an area with a New Zealand Deprivation Index score of 9 (Ministry of Health- Manatū Hauora, 2013). The Deprivation Index scores range from 1 (Least deprived) to 10 (Most deprived) and is based on factors such as income, employment, and educational qualifications (Atkinson, Salmond, & Crampton, 2014). Thus this study's sample may not have been truly representative of the New Zealand HA population. Furthermore, even after agreeing to participate, many clients did not complete the Pre-fitting Questionnaire and/or the Post-fitting Questionnaire. This could have resulted in a response bias. Of the questionnaires that were returned, some were not fully completed. There are two possible reasons for this. Firstly, clients may not have answered items if they did not understand them. Dillon et al. (1991) discussed the possibility for misinterpretation of questions when surveys are mailed out and filled in solely by the client. Secondly, self-report measures contain a fixed list of situations but certain situations

may be irrelevant to the client. Respondents may have decided to simply not answer these questions which may have skewed the overall results of their answers.

Finally, the data was gathered by clinics from one private audiological company in New Zealand which fits HAs from predominantly one manufacturer. Therefore, it is unknown if the findings are applicable to all brands of HAs and all clinic groups in this country.

4.5 Future research

Currently, there are only provisional norms for the SADL. Norms for certain distinct groups (e.g. different styles of HAs) would be useful clinically. This would allow clinicians to compare a client's results to relevant norms and determine if their level of satisfaction is acceptable depending on their personal or HA characteristics (Uriarte et al., 2005).

More research is needed to further explore the relationship between communication and HA self-efficacy and HA satisfaction. Given change in communication self-efficacy was related to HA satisfaction, it would be interesting to see if self-efficacy training results in more changes in communication self-efficacy and consequently greater HA satisfaction. Similarly, the effects of counselling of clients to ensure high HA self-efficacy could be examined. Other variables newly found to relate to HA satisfaction are change in hearing ability and hearing handicap. Again further research is needed to confirm and explore these relationships.

Given the low satisfaction ratings regarding cost of HAs, future research could be conducted regarding satisfaction levels between funding groups. In New Zealand, all adults who require HAs and do not receive funding through another pathway are eligible to a subsidy every 6 years (Ministry of Health- Manatū Hauora, 2011). Other funding pathways are:

- Veteran's Affairs which supplies HAs every five years for veterans who have HI as a result of military services (Veterans' Support Act, 2014)
- Accessable which covers the price of HAs every six years for adults with complex needs, e.g. individuals with dual or multiple disabilities (Ministry of Health-Manatū Hauora, 2011)
- Accident Compensation Corporation (ACC) which provides some funding every six years for individuals with HI caused by prolonged occupational noise exposure or sudden trauma that has damaged hearing (Accident Compensation Corporation, 2014).

It would be interesting to note if there are differences in HA satisfaction between HA users who received partial versus full funding.

This study indicates that satisfaction levels are mostly very high among participants three months post-fitting. McLeod & Upfold (2003) determined it only takes up to seven weeks for most SADL scores to stabilize although the Service and Cost scores take 24 to 27 weeks. It would be interesting to repeat the SADL among this study's population six months post-fitting to see if scores, in particular Service and Cost scores, change. It could also be worthwhile examining satisfaction levels two to six years post-fitting given New Zealand funding is only eligible every five or six years (depending on the funding method).

4.6 Conclusion

This cross-sectional study aimed to determine current satisfaction levels among the New Zealand population. Results were very promising in that average SADL scores were high and the majority of participants fell within or above the norms established by Cox & Alexander (1999). Results varied slightly from previous research indicating that findings can differ with time and across countries. In particular, a comparatively high mean score was

found for the Negative Features subscale which suggests that HA technology is improving. Of concern is the low mean score for the Service and Cost subscale. In particular satisfaction was low regarding the cost of HAs. More research is needed to determine if satisfaction differs depending on funding of HAs or across clinic groups or if this low rating of satisfaction is present across the population. This is relevant as dissatisfaction of cost negatively affects overall satisfaction with HAs and may affect HA uptake.

This study also aimed to investigate what client factors related to HA satisfaction. HA satisfaction was found to significantly relate to age, gender, change in hearing ability, hearing handicap, pre-fitting communication self-efficacy, change in communication self-efficacy, and HA self-efficacy. Of note, HA self-efficacy was accountable for a relatively large amount of variance in satisfaction scores. Pre-fitting communication self-efficacy and change in communication self-efficacy were also noted to significantly relate to SADL scores. Therefore, self-efficacy is an important concept in regards to HA satisfaction and should be investigated further. Clinically, it is important to assist clients attain high levels of communication and HA self-efficacy.

In this study, many factors only related to one SADL subscale and some findings differed from that of older research that used single-item satisfaction measures. Thus, this study supports the use of a validated satisfaction questionnaire that investigates various aspects of HA satisfaction. Valid and reliable outcome measurement is useful for the clinician to ensure the client's needs are being met.

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Appendix 1: Ethical Approval Letter

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2014/59

16 July 2014

Caitlin Kengmana
Department of Communication Disorders
UNIVERSITY OF CANTERBURY

Dear Caitlin

The Human Ethics Committee advises that your research proposal "What client-related factors are related to hearing aid satisfaction among hearing aid users in New Zealand" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 14 July 2014.

Best wishes for your project.

Yours sincerely

Lindsey MacDonald
Chair
University of Canterbury Human Ethics Committee

Appendix 2: Pre-fitting Questionnaire

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Communications Disorders Department
Private Bag 4800
Christchurch 8140
New Zealand
Email: csk23@uclive.ac.nz

What client-related factors are related to hearing aid satisfaction among hearing aid users in New Zealand

Pre-fitting Questionnaire

1. What is your date of birth (*DD/MM/YYYY*)? ……/……/…….

2. Please circle your gender: Female / Male / Other

3. a) Is English your first/native language? Yes / No

   b) If no, what is your first/native language?
   _____

4. a) Have you used hearing aids before: Yes / No

   b) If yes, how many years did you wear hearing aids for?
   _____

5. On a scale from 1 to 10, 1 being poor and 10 being excellent, how would you rate your overall hearing ability?
   Poor **1 2 3 4 5 6 7 8 9 10** *Excellent*

6. On a scale from 1 to 10, how important is it for you to improve your hearing right now?
   Not at all important **1 2 3 4 5 6 7 8 9 10** *Very important*

For questions 7-26, please read each of the following situations. Please rate ***how well you believe that you can hear*** *and* ***how confident you are that you can manage communication in each situation*** *by circling the number that best applies to you regardless of whether or not you currently wear a hearing aid/s.*

Sample Situation & Rating:
You are on the bus and a stranger talks to you with one hand over her/his mouth.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all — Moderately well — Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all — Moderately confident — Very confident

7. You are having a conversation with a friend or family member in your home. The room is dark because the curtains are partially closed and the light is off.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all — Moderately well — Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all — Moderately confident — Very confident

8. Your friend/family member is trying to talk to you when she/he is in another room.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all — Moderately well — Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all — Moderately confident — Very confident

9. You are at a party where the conversation is noisy. Someone who you have never met before comes over to speak to you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

10. You are at the doctor's office. The receptionist calls you from across the room to let you know that it is your turn to see the doctor.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

11. You are watching television at home. The actors speak amid the background music.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

12. You hold a card party in your home. You are seated at a table with people you do not know very well.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

13. You are at home watching television with a family member. She/he turns and speaks to you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

14. You are going to a public lecture. There are no seats available near the speaker.
How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

15. You are waiting for a train/plane at a busy station. Your friend is sitting beside you and says something without looking at you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

16. You hold a party in your home. Someone you do not know very well starts up a conversation. She/he puts one hand over her/his mouth when they are speaking.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?
0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

17. You are having a family dinner in your home. There is more than one conversation occurring at a time.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

18. You are at a wedding reception with 200 guests. Your friend/family member starts talking to you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

19. You are in a restaurant with a family member or friend. You are seated in a dim & noisy spot.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

20. You telephone a family member/friend using a pay phone. There is a lot of noise from people passing behind you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

21. You are at home. The telephone rings. You do not recognize the caller's voice and cannot understand what she/he is saying.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

22. You answer the door. The postal carrier hands you a package and asks you a question.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

23. You attend a meeting with 3 other persons. You have attended this meeting on a regular basis.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

24. You are in the grocery store. The person at the checkout tells you the total of your bill.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

25. You are at home watching television with a friend/family member. The volume on the television is too soft.

How well can you hear in this situation?

0	1	2	3	4	5	6	7	8	9	10
Not well at all					Moderately well					Very well

How confident are you that you can manage this situation?

0	1	2	3	4	5	6	7	8	9	10
Not confident at all					Moderately confident					Very confident

26. You are in the bank. You go to the teller to ask about your bank balance.

How well can you hear in this situation?

0	1	2	3	4	5	6	7	8	9	10
Not well at all					Moderately well					Very well

How confident are you that you can manage this situation?

0	1	2	3	4	5	6	7	8	9	10
Not confident at all					Moderately confident					Very confident

For questions 27 to 38, please circle the letter that is the best answer for you. The list of words on the right gives the meaning for each letter.

A Never
B Rarely
C Sometimes
D Often
E Almost always

27. How often does your hearing difficulty restrict the things you do?	A	B	C	D	E
28. How often do you feel worried or anxious because of your hearing difficulty?	A	B	C	D	E
29. As a result of your hearing difficulty, how often do you feel embarrassment when in the company of other people?	A	B	C	D	E
30. How often is your self-confidence affected by your hearing difficulty?	A	B	C	D	E
31. How often does your hearing difficulty make you feel nervous or uncomfortable?	A	B	C	D	E
32. How often does any difficulty with your hearing make you feel self-conscious?	A	B	C	D	E
33. How often does your difficulty with your hearing affect the way you feel about yourself?	A	B	C	D	E
34. How often are you inconvenienced by your hearing difficulty?	A	B	C	D	E
35. How often do you feel inclined to avoid social situations because of your hearing difficulty?	A	B	C	D	E
36. How often do you feel cut off from things because of your hearing difficulty?	A	B	C	D	E
37. How often does your hearing difficulty restrict your social or personal life?	A	B	C	D	E
38. How often do you feel tense and tired because of your hearing difficulty?	A	B	C	D	E

Appendix 3: Post-fitting Questionnaire

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Communications Disorders Department
Private Bag 4800
Christchurch 8140
New Zealand
Email: csk23@uclive.ac.nz

What client-related factors are related to hearing aid satisfaction among hearing aid users in New Zealand

DATE: DD / MM / YY

Post-fitting Questionnaire

For questions 1-20, please read each of the following situations. Please rate ***how well you believe that you can hear*** *and* ***how confident you are that you can manage communication in each situation*** *by circling the number that best applies to you.*

Sample Situation & Rating:
You are on the bus and a stranger talks to you with one hand over her/his mouth.

How well can you hear in this situation?

0	1	2	3	4	5	6	7	8	9	10
Not well at all					Moderately well					Very well

How confident are you that you can manage this situation?

0	1	2	3	4	5	6	7	8	9	10
Not confident at all					Moderately confident					Very confident

1. You are having a conversation with a friend or family member in your home. The room is dark because the curtains are partially closed and the light is off.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

2. Your friend/family member is trying to talk to you when she/he is in another room.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

3. You are at a party where the conversation is noisy. Someone who you have never met before comes over to speak to you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

4. You are at the doctor's office. The receptionist calls you from across the room to let you know that it is your turn to see the doctor.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

5. You are watching television at home. The actors speak amid the background music.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

6. You hold a card party in your home. You are seated at a table with people you do not know very well.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

7. You are at home watching television with a family member. She/he turns and speaks to you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

8. You are going to a public lecture. There are no seats available near the speaker.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

9. You are waiting for a train/plane at a busy station. Your friend is sitting beside you and says something without looking at you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

10. You hold a party in your home. Someone you do not know very well starts up a conversation. She/he puts one hand over her/his mouth when they are speaking.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

11. You are having a family dinner in your home. There is more than one conversation occurring at a time.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

12. You are at a wedding reception with 200 guests. Your friend/family member starts talking to you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

13. You are in a restaurant with a family member or friend. You are seated in a dim & noisy spot.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

14. You telephone a family member/friend using a pay phone. There is a lot of noise from people passing behind you.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

15. You are at home. The telephone rings. You do not recognize the caller's voice and cannot understand what she/he is saying.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

16. You answer the door. The postal carrier hands you a package and asks you a question.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

17. You attend a meeting with 3 other persons. You have attended this meeting on a regular basis.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

18. You are in the grocery store. The person at the checkout tells you the total of your bill.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

19. You are at home watching television with a friend/family member. The volume on the television is too soft.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

20. You are in the bank. You go to the teller to ask about your bank balance.

How well can you hear in this situation?

0 1 2 3 4 5 6 7 8 9 10
Not well at all Moderately well Very well

How confident are you that you can manage this situation?

0 1 2 3 4 5 6 7 8 9 10
Not confident at all Moderately confident Very confident

Instructions: These questions (21-44) ask about your ability to do certain activities with a hearing aid, and they also ask about your ability to hear in certain situations. Given what you know right now, indicate how confident you are that you could do the things described here. If you have never been in these situations, then make your best guess about how well you could do.

Sample questions:

a. I can lift a 10-pound object with ease.
How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

b. I can easily tell the difference between a19-pound object and a 20-pound object.
How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

21. I can insert a battery into a hearing aid with ease.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

22. I can remove a battery from a hearing aid with ease.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

23. I can tell a right hearing aid from a left hearing aid.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

24. I can insert hearing aids into my ears accurately.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

25. I can remove hearing aids from my ears with ease.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

26. I can identify the different components of a particular hearing aid (i.e. microphone, battery door, vent, etc.).

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

27. I can operate all the controls on a particular hearing aid (knobs, switches, and/or remote control) appropriately.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

28. I can stop a hearing aid from squealing.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

29. I can troubleshoot a hearing aid when it stops working.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

30. I can clean and care for a hearing aid regularly.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

31. I can name the make or model of a particular hearing aid.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

32. I can name the battery size needed for a specific hearing aid.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

33. I could get used to the sound quality of hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

34. I could get used to how a hearing aid feels in my ear.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

35. I could get used to the sound of my own voice if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

36. I could understand a one-on-one conversation in a quiet place if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

37. I could understand conversation in a small group in a quiet place if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

38. I could understand conversation on a standard telephone if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

39. I could understand television if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

40. I could understand the speaker/lecturer at a meeting or presentation if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

41. I could understand a one-on-one conversation in a noisy place if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

42. I could understand conversation in a small group while in a noisy place if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

43. I could understand a public service announcement over the loudspeaker in a public building if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

44. I could understand conversation in a car if I wore hearing aids.

How certain are you that you can do this? (circle percentage)

0%	10	20	30	40	50	60	70	80	90	100%
Cannot do this at all					Moderately certain can do					I am certain I can do this

INSTRUCTIONS: Listed below are two questions on your opinions about your hearing aid(s). For each question, please circle the answer that is best for you. Keep in mind that your answers should show your general opinions about the hearing aids that <u>you are wearing now or have most recently worn.</u>

45. On a scale from 1 to 7, how physically comfortable are your hearing aids in your ears?

Not at all comfortable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Very comfortable*

46. Does your hearing aid/s feedback (whistle)? Yes / No

a. If Yes, how often does your hearing aid feedback (whistle?) from 1 being never to 7 being almost always.

Never	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Almost always*

INSTRUCTIONS: Listed below are questions on your opinions about your hearing aid(s). For each question (47-61), please circle the letter that is the best answer for you. The list of words on the right gives the meaning for each letter. Keep in mind that your answers should show your general opinions about the hearing aids that <u>you are wearing now or have most recently worn.</u>

A Not At All
B A Little
C Somewhat
D Medium
E Considerably
F Greatly
G Tremendously

47. Compared to using no hearing aid at all, do your hearing aids help you understand the people you speak with most frequently?	A	B	C	D	E	F	G
48. Are you frustrated when your hearing aids pick up sounds that keep you from hearing what you want to hear?	A	B	C	D	E	F	G
49. Are you convinced that obtaining your hearing aids was in your best interests?	A	B	C	D	E	F	G
50. Do you think people notice your hearing loss more when you wear your hearing aids?	A	B	C	D	E	F	G
51. Do your hearing aids reduce the number of times you have to ask people to repeat?	A	B	C	D	E	F	G
52. Do you think your hearing aids are worth the trouble?	A	B	C	D	E	F	G
53. Are you bothered by an inability to get enough loudness from your hearing aids without feedback (whistling)?	A	B	C	D	E	F	G
54. How content are you with the appearance of your hearing aids?	A	B	C	D	E	F	G
55. Does wearing your hearing aids improve your self-confidence?	A	B	C	D	E	F	G
56. How natural is the sound from your hearing aids?	A	B	C	D	E	F	G
57. How helpful are your hearing aids on MOST telephones with **NO** amplifier or loudspeaker? **(If you hear well on the telephone <u>*without*</u> hearing aids, check here □)**	A	B	C	D	E	F	G
58. How competent was the person who provided you with your hearing aids?	A	B	C	D	E	F	G
59. Do you think wearing your hearing aids makes you seem less capable?	A	B	C	D	E	F	G
60. Does the cost of your hearing aids seem reasonable to you?	A	B	C	D	E	F	G
61. How pleased are you with the dependability (how often they need repairs) of your hearing aids?	A	B	C	D	E	F	G

Appendix 4: Clinician HA Information Form

FRHAS Study – Client Hearing Aid Info

Client #		
Client age at fitting date	____ years	
How long has the client been aware of having a hearing loss for?	_____ years	
Length of trial period	____weeks	
Number of sets of HAs trialled	(*e.g. one set, two sets)*	
Number of appointments during trial	(include x2, x3s and finalisation appt)	
Number of appointment(s) rescheduled due to technical problem?	(e.g. equipment or software problem)	
Clinician changed during trial?	Yes / No If Yes, reason:	
HA replaced by manufacturer during trial due to a HA fault?	Yes / No If Yes, reason:	
HA replaced during trial due to a problem with fit/colour/style?	Yes / No If Yes, reason:	
Datalogging – average hours of use per day at end of trial	_____ hrs/day	
Brand and Model of HAs	(eg. ReSound Linx 7)	
Style of HA(s)	RITE / BTE / ITE / ITC / CIC / IIC / CROS/ Other:_____ *(circle one)*	
Level of HA technology	Elite/Advanced/Active/Essential/Basic/Starter *(circle one)*	
HA Funder	Private / Subsidy / ACC / Insurance / WP / Accessable / Finance / WINZ / Other:_____ *(circle all that apply)*	
Price paid for HAs	Total =	Private portion =
Unilateral or Bilateral fitting	Unilateral/Bilateral (*delete one*) **Other:** (*eg. CROS*)	
Fitting rationale used for REMs	NAL-NL2/DSL/Other:_____	
Volume Control active	Yes / No (*delete one*)	
Number of programs (incl. autophone)		
Remote control fitted	Yes / No/ SmartPhone App (*delete two)*	
HA accessories fitted	Yes / No If yes, what?	