
**Patient recall of tinnitus information after initial
audiological assessment**

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Abstract

Aims: This study addressed the challenge of evaluating and improving patient education material as well as recall of information from a tinnitus counselling session. The first aim was to examine the readability and suitability of two tinnitus patient education brochures provided by an audiology clinic to new tinnitus patients. If the readability of the brochures were higher than international recommendations for reading grade level (RGL), then an attempt to rewrite a brochure to a suitable RGL would be made. The second aim was to investigate a) the amount of information tinnitus patients can successfully recall directly following their initial appointment, b) the amount of information that is retained one to two weeks following their appointment, c) whether the amount of information recalled is related to patient variables, and d) the themes that arose from interviews with the patients.

Method: To address study aim 1, readability analyses were completed for two patient tinnitus brochures provided to new patients at a private hearing aid clinic using several readability formulas. If found to have a readability level over 5th grade level one brochure would be rewritten to an acceptable readability level while attempting to maintain the initial level of content. The suitability of the brochures was assessed by two experts in the area of health literacy using the Suitability Assessment of Material (SAM). To address study aim 2, eight participants consulting for tinnitus services were prospectively identified by a clinical audiologist at a private hearing aid clinic. Immediately following the initial tinnitus counselling session, participants took part in a digitally-recorded

seven-item open-ended interview and provided demographic and audiological information. One to two weeks later, a second interview using the same questions was conducted.

Results: After analyzing the readability of the brochures it was evident that both exceeded the recommended RGL on the Flesch-Kincaid (F-K), Fry, Fog, and Simple Measure of Gobbledygook (SMOG). The experts rated Brochure 1 as “unsuitable” for patient education and Brochure 2 as “adequate” for patient education using the SAM. Brochure 1 was revised and was within the internationally recommended RGL as measured by the F-K, Fry, and Fog, whilst keeping the content similar to the original. Overall, participants correctly recalled only a small amount of information in the immediate (36.8%) and one to two weeks later (33.7%). There was no significance difference in amount of correctly recalled information between appointments, and none of the correlations performed for recall and participant variables were statistically significant. Effect sizes were calculated and no trend was found for audiometric variables, although demographic variables did tend to explain more of the variance in recall in the short-term than immediately. The most notable themes identified in the interview immediately after the appointment were: Hearing aids, Understanding/Empowerment, and Masking/Music therapy. At the short-term follow up interview, Hearing aids, Cost, and Hope/Positive were commonly reported.

Conclusions: As over half of New Zealanders do not have adequate health literacy skills to meet the demands of life and work (Ministry of Health, 2010) it follows that written and verbal health information should be easy

understandable to allow patients to take an active role in their health care and experience the best possible health outcomes. Overall, participants only remembered modest amounts, only one brochure was adequate for patient education, and the RGL of both brochures were higher than recommended. There is a great need for more studies examining suitability, readability, and patient recall not only in tinnitus, but in all areas of healthcare.

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List of Abbreviations

Terms

ADL	Activities of daily living
ASHA	American Speech-and-Language-Hearing Association
BEPTA	Pure tone average of the better hearing ear
CAPD	Central Auditory Processing Disorder
CAS	Central auditory system
CBT	Cognitive behavioural therapy
CNS	Central nervous system
F-K	Flesch-Kincaid Formula
FOG	The Gunning's Fog Index Readability Formula
FRE	Flesch Reading Ease Formula
HA	Hearing aids
ICC	Intraclass correlations
LLE	Logic, language, experience
PTA	Pure tone average
RGL	Reading grade level
SAM	Suitability of Materials
SMOG	Simple Measure of Gobbledygook
THI	Tinnitus Handicap Inventory
TRQ	Tinnitus Reaction Questionnaire
TRT	Tinnitus retraining therapy
WEPTA	Pure tone average of the worse hearing ear
WHOQoL-BrEF	World Health Organization Quality of Life-BREF

Chapter 1

1.1 Overview

This chapter will initially discuss the different types of tinnitus, various causes, prevalence around the world and prevalence specific to New Zealand. Also described will be the way in which tinnitus is diagnosed and subsequently treated. Additionally, the negative impacts of tinnitus on quality of life, and help-seeking behaviour will also be examined.

Following the information specific to tinnitus, the topics of health literacy and patient education will be explored. Readability and suitability will be discussed with reference to the most appropriate levels for patient information and whether this is reflected in the level of patient resources provided. Finally, patient recall and the factors impacting how well patients remember health information will be examined, which leads into the aims of the present study.

Patients require many different skills to function effectively in a health care setting, including numeracy, print literacy/reading, and oral literacy (Berkman et al., 2011). Therefore this study will take a holistic view of literacy, aiming to assess different aspects of it, including oral literacy through tinnitus patients' ability to recall information related to their appointment in the short and medium term, and reading and print literacy through examining the readability and suitability of two tinnitus patient education brochures which are received either prior to or following their initial tinnitus appointment. This study will also examine the impact of age, level of qualification, previous hearing aid use, tinnitus and hearing loss severity, and anxiety (via reaction scores) on the amount of information recalled correctly.

1.2 Types of Tinnitus

The term *tinnitus* was derived from the Latin word *tinnire*, to ring (Baguley, McFerran, & Hall, 2013). While a number of people do describe their tinnitus as a ringing sound, this simply does not encompass the many different forms in which tinnitus can present itself.

Tinnitus refers to the experience of perceiving sound in the absence of corresponding external stimuli (Holmes & Padgham, 2009; Møller, Langguth, DeRidder, & Kleinjung, 2010). This sound is often described as a hissing, buzzing (Langguth, Kreuzer, Kleinjung, & De Ridder, 2013), sizzling (Baguley et al., 2013), roaring, or chirping (Folmer, Martin, & Shi, 2004). On rare occasions, the sound can be depicted as voices or music (Baguley et al., 2013). Voices or music heard as a form of tinnitus are vague and do not convey meaning. This differentiates them from those heard when individuals experience auditory hallucinations (Baguley et al., 2013). Tinnitus can be described in a number of ways. The first by location e.g. whether it is heard in the left, right, both ears, or inside the head. The second is by character e.g. tonal, constant, high or low frequency, or pulsatile. The third is by intensity. This is typically measured by using loudness matching or a visual analogue scale. Visual analogue scales are clinical tools which can be used for measuring change in chronic tinnitus annoyance and loudness (Adamchic, Langguth, Hauptmann, & Tass, 2012). Loudness matching of tinnitus assists in identifying a patient's level of annoyance with their tinnitus and quantifying its severity (Andersson, 2003). The last factor is by other features e.g. whether the patient can change their tinnitus with eye or jaw movement (Møller et al., 2010). It may begin abruptly although is gradual in many cases (Baguley et al., 2013). Tinnitus may be acute or chronic (Folmer et al., 2004),

and can be divided into two general categories: subjective or objective (McFerran & Phillips, 2007).

One objective form is pulsatile tinnitus, which can be synchronous with the individual's heartbeat therefore most likely due to vascular causes (Folmer et al., 2004). Potential vascular causes include acquired arteriovenous shunt, carotid stenosis or high-riding carotid artery, vascular loop, dehiscent jugular bulb, or congenital arteriovenous fistula (Folmer et al., 2004). Pulsatile tinnitus may also be asynchronous, therefore more likely due to middle-ear muscle myoclonus (Baguley et al., 2013). This can be observed by others through using a stethoscope and ear tube connected to the patients' affected ear(s). This is called auscultation (Kaufman & Balkany, 1971). Other forms of objective tinnitus may be generated due to mechanical disorders such chronically patent Eustachian tube, temporomandibular joint disorder (Folmer et al., 2004), spontaneous outer hair cell activity, stapedius or tensor tympani muscle tensing (Lockwood, 2002).

Subjective tinnitus is by far the most common type of tinnitus, and covers a large number of subgroups with different pathophysiologies, characteristics and severities to the point where it could be split into a group of disorders instead of one clinical entity (Møller et al., 2010). Subjective tinnitus can only be recognized by the patients themselves and shares a likeness with central neuropathic pain and phantom limb syndrome. There are generally no physical signs accompanying subjective tinnitus, and only the patient's own evaluations can provide insight for clinical evaluation. Subjective tinnitus often co-occurs with hypersensitivity to sounds or hyperacusis (lowered sound tolerance) (Møller et al., 2010).

1.3 Causes of Tinnitus

Head trauma, closed head injuries due to blast damage, or damage to the auditory nerve via surgery or trauma may result in tinnitus (Møller et al., 2010, p. 6). Tinnitus can be associated with hearing loss, ageing (Eggermont & Roberts, 2004), excessive noise exposure, or stress disorders: although the onset of tinnitus most commonly cannot be attributed to any single event. Some well-known drugs for damaging the cochlea therefore potentially able to induce tinnitus are: aminoglycosides, antibiotics, cisplatin, anti-malarial medication, salicylates, and loop diuretics (Pirodda, Borghi, & Ferri, 2010).

A number of otological conditions are known risk factors for the development of tinnitus. These include: vestibular schwannoma, Ménière's disease, impacted cerumen, meningioma, mastoiditis, excessive noise exposure, otosclerosis, labyrinthitis, sensorineural hearing loss, and high frequency hearing loss in particular (Baguley et al., 2013). As these otological ailments are major risk factors for tinnitus, the sounds may be a neuroplastic response to sensory deprivation (Eggermont & Roberts, 2004). Møller (2010) recommended that the more common form, subjective tinnitus, is so clinically heterogeneous that it should be further classified into a group of disorders that differ on pathophysiology, severity, and characteristics. It therefore follows that there is unlikely to be a single model, hypothesis, or theory that will explain the underlying pathophysiology of tinnitus for those affected (Baguley, 2002).

One mechanism which has been put forward proposes that tinnitus is a "plasticity disorder" (Møller, 2008) and that the target for tinnitus therapy should be this plasticity. After there is an injury of the peripheral system, the plastic changes of the central auditory system (CAS) result in the pathological activity. In a normal

CAS, plasticity is useful for regulating neuronal activity in response to different acoustic environments. Damage to the cochlea can result in decreased input to the auditory processing hierarchy. Due to this loss of input there is an overcompensation by boosting neural synchrony and spontaneous activity (von der Behrens, 2014).

There has been a long-held misconception that the cause of tinnitus has cochlear origins. It has become evident that tinnitus can still be present after the severing of the auditory nerve; therefore removing the cochlea's input to the auditory system (Kreuzer, Vielsmeier, & Langguth, 2013). It follows that tinnitus does not necessarily originate from the imbalance of firing across the damaged cochlea's tonotopic array (Baguley et al., 2013). While tinnitus may be activated by damage to the inner ear, the neural generators are more commonly found centrally. Whilst the neural generators are most frequently auditory, the non-auditory centres may also participate (Kaltenbach, 2010). Similar to phantom limb syndrome, amplified stimulation is created along the auditory pathway in response to decreased hearing ability in the majority of cases (Noreña, 2011). A surge of central auditory pathway activity may be a result of abnormal somatosensory afferent nerve activity (Shore, 2011). Patients with chronic tinnitus experience parietal, frontal, and limbic area changes, not purely within the auditory structures (Adjamian, Sereda, & Hall, 2009; Schlee, Weisz, Bertrand, Hartmann, & Elbert, 2008).

The current views around the origin and pathophysiology of tinnitus in humans are commonly taken from animal models (Eggermont & Roberts, 2004; Noreña, 2011), although there is controversy around whether this is generalisable to humans (Eggermont, 2013). At this time, it is assumed that the animal models of

hearing loss and the neural changes measured which have been measured correlate with human clinical symptoms (Adjamian et al., 2009).

As subjective tinnitus is connected to elementary plasticity of the auditory processing within the central nervous system (CNS), it is very important to thoroughly understand these mechanisms to further develop therapies to help in the management of the disorder (von der Behrens, 2014). Investigating these underlying mechanisms is usually not possible in human participants, as the experiments are on the level of small networks and individual neurons (von der Behrens, 2014). Invasive experiments using animals are able to look at individual neurons with high temporal and spatial resolution. The methods used often involve intra- and extracellular recordings in sound-exposed or genetically engineered animals (von der Behrens, 2014). Species used for these experiments include rats (Bauer, Brozoski, Rojas, Boley, & Wyder, 1999; Lobarinas, Sun, Cushing, & Salvi, 2004; Lobarinas et al., 2006), hamsters (Heffner & Harrington, 2002), and chinchillas (Brozoski, Bauer, & Caspary, 2002). Different tinnitus inducers include noise-exposure (Brozoski et al., 2002; Heffner & Harrington, 2002), salicylate (Bauer et al., 1999; Lobarinas et al., 2004; Lobarinas et al., 2006), and quinine (Lobarinas et al., 2006). Consequently these animal models are a significant part of the efforts to discover new therapies for subjective tinnitus (von der Behrens, 2014).

1.4 Tinnitus and Quality of Life

One important reason it is important to develop new therapies for tinnitus is to improve the tinnitus patients' quality of life, particularly those who experience significant impairments in their day to day living.

For the majority of those who suffer from chronic subjective tinnitus, it does not significantly affect their ability to function in daily life. However, approximately 0.3 to 1% of those affected experience severe and debilitating tinnitus that impacts their quality of life (Andersson, Baguley, McKenna, & McFerran, 2005; A. Davis & El Rafaie, 2000; Khedr et al., 2010; Searchfield, n.d.). Tinnitus can be a highly upsetting condition and can also result in or coincide with: irritability, anxiety, insomnia, concentration problems, (Langguth, 2011) depression, phonophobia (fear of auditory stimuli), and hyperacusis (Møller et al., 2010). According to Kotchkin, Tyler, and Born's (2011) US survey, individuals with tinnitus suffer from decreased ability to hear (39%), sleep (20%), and concentrate (26%). At worst, tinnitus can even contribute to suicide (Møller et al., 2010).

It has been shown that individuals with tinnitus have a stronger connection between the auditory cortex and these areas than in individuals who do not report tinnitus (Schlee et al., 2009; Schlee et al., 2008). The negative feelings linked to tinnitus are reflected by the group activation of the anterior insula, amygdala, anterior cingulum, as well as other structures in the distress network. This distress network also contributes to somatoform and pain disorders (Landgrebe et al., 2008).

In Lasisi, Abiona, and Gureje's (2010) study which examined the impact of tinnitus in older Nigerian adults, individuals with the disorder had a lower quality of life and an inferior perception of their general health than those without tinnitus. Those who suffered from tinnitus also had twice the possibility of suffering from an impairment in their activities of daily living (ADL). The reported odds ratio for impaired ADLs was 1.7 (95% CI = 1.0, 2.7) with a p-value of 0.04, and the odds ratio for impaired instrumental activities of daily living was 1.8 (95% CI = 1.1, 3.1) with a

p-value of 0.03. Similarly, the odds ratio for self-rated health was 1.8 (1.5, 2.2) with a p-value of 0.01. The mean quality of life scores for participants with tinnitus were significantly lower in all regions (physical, psychological, social, and environmental domains) of the World Health Organization Quality of Life-BREF (WHOQoL-BREF).

One way to measure quality of life in tinnitus patients is through the tinnitus reaction questionnaire (TRQ). The TRQ measures the psychological distress associated with tinnitus and may be used as an assessment tool in a research or clinical context (Wilson, Henry, Bowen, & Haralambous, 1991). The TRQ consists of twenty-six items that are rated by the patient on a scale of 0-4 (not at all, a little of the time, some of the time, a good deal of the time, almost all of the time). The score is tallied up and at maximum patients can score 104, which would indicate the highest amount of distress associated with their tinnitus.

Wilson et al., (1991) describes psychometric analyses of the TRQ with three sets of participants totaling 156. The majority (105) reported bilateral tinnitus, and the average duration of tinnitus was 9.4 years. In a self-reporting measure, 26 participants rated their tinnitus as severe, 125 rated their tinnitus as moderate, and five rated their tinnitus as mild. The study comprised of 105 male and 51 female participants, with an average age of 58.6 years (Wilson et al., 1991).

Wilson et al., (1991) found that the TRQ had excellent internal consistency where Cronbach's alpha = .96 and test-retest reliability where $r = .88$. Correlations between the TRQ and clinician ratings ($r = .67$) were moderate and correlations between depression and anxiety ($r = .58$ and $.87$, respectively) were moderate to high. There was a low correlation for neuroticism where $r = .27$. Factor analysis was

performed and revealed four factors: Avoidance, General Distress, Severity, and Interference (Wilson et al., 1991). Overall, results indicate that the TRQ has high reliability and moderate to high validity, with the exception of low correlations for neuroticism.

It is evident that for a small proportion of individuals, tinnitus can significantly impact their lives, although even for the wider majority of those who suffer from tinnitus it can interfere with their quality of life, such as negatively impacting sleep, concentration, or hearing (Kochkin et al., 2011).

1.5 Prevalence of Tinnitus

It is difficult to accurately describe the prevalence of tinnitus because epidemiology studies define tinnitus differently, frequently only including those who are concerned enough to actively seek help for their tinnitus (Møller et al., 2010). Generally, epidemiology studies have showed that tinnitus affects approximately 10 to 15% of the population at some point in their lifetime (Andersson et al., 2005; Baguley et al., 2013; A. Davis & El Rafeaie, 2000; Kreuzer et al., 2013) although this figure increases with age and the presence of hearing loss (Weinstein, 2000).

In the United States of America, approximately 10% of the population suffer from tinnitus. However, the incidence increases to 26.7% in those older than 65 years (Kochkin et al., 2011). Around 25% of Americans with tinnitus reported their tinnitus as significantly impacting their quality of life. Two million of the sixteen million individuals who present for professional help are 'debilitated' by their tinnitus (Holmes & Padgham, 2009).

In the United Kingdom, the most reliable and largest study of tinnitus epidemiology was completed within the National Study of Hearing in England (Baguley et al., 2013). The data from 48,313 participants revealed that the rate of persistent spontaneous tinnitus in adults was 10.1%. In this study, persistent spontaneous tinnitus was defined as lasting more than five minutes per time, that it begins spontaneously, and did not occur in response to auditory stimuli. Five percent of these patients reported their tinnitus as ‘moderately to severely annoying’ and a further 0.5% described their tinnitus severely impacted their quality of life (A. Davis & El Rafaie, 2000).

Michikawa et al. (2010) completed community-based interviews exploring the epidemiology of tinnitus in Japan with 1320 elders. The overall prevalence of tinnitus in this group was 18.6%, more specifically 19% for females, and 18% for men. There was no increased prevalence of tinnitus with increased age within the sample, although participants were over the age of sixty five years. It was found that there was no statistical difference in prevalence for either age or gender.

A longitudinal cohort study was undertaken in Nigeria by Lasisi, Abiona, and Gureje (2010) with 1302 participants over the age of 65. The prevalence of tinnitus within this group was 14.1%. Head injury and frequent otitis media during childhood were the factors most strongly associated with tinnitus. Rhinosinosis and dizziness were also related to tinnitus prevalence. Similar to Michikawa et al. (2010), gender and age had no significant relationship with prevalence. Furthermore, smoking, amount of alcohol consumed, educational level, and economic status were not associated with tinnitus either.

In Egypt, an epidemiology study by Kehdr (2010) revealed that approximately 5% (439 of the 8484) of the participants experienced tinnitus. There was no gender difference reported, and, consistent with the above studies, prevalence increased with age (above sixty years). In 15% of the participants who reported having tinnitus, it was reported that it severely affected their quality of life. An Italian study by Quaranta (1996) found similar results to the studies based in other populations, with a tinnitus prevalence of 14.5%.

According to the NZ Tinnitus and Hyperacusis Support Network, approximately 15 to 20% of New Zealanders experience tinnitus. It is reported that around 1% suffer from tinnitus to a debilitating degree (Searchfield, n.d.). Dawes and Welch (2010) completed a longitudinal study of New Zealanders who were born at Dunedin Hospital between 1972 and 1973 to investigate the relationship of childhood hearing and/or middle ear difficulties and tinnitus in early adulthood. The participants involved were part of a larger study, the Dunedin Multidisciplinary Health and Development Study, and were followed from birth, and represented a diverse range of socioeconomic statuses and were primarily of European ancestry. The participants were checked for otitis media at five, seven, and nine years of age. Tympanometry and hearing thresholds were assessed at 11 years of age. Tympanic membranes of all participants were examined at 15 years of age.

Of the 968 study participants (32 years of age), 54.9% reported not experiencing tinnitus in the last twelve months, 38.3% reported experiencing it 'rarely' and 6.8% reported experiencing tinnitus 'half of the time or more' (Dawes & Welch, 2010).

There is limited information available examining tinnitus prevalence in the New Zealand population. The approximate figures presented by Searchfield (n.d.) and the

published data reported by Dawes and Welch (2010) do not correspond well. The figures presented by Searchfield (n.d.) do not provide detail about the frequency of tinnitus required before it is considered significant. The data provided by Dawes and Welch (2010), conversely, specifies the frequency of tinnitus required by participants to be included in each subgroup e.g. 'rarely' and 'more than half of the time' giving a greater amount of detail. The average values given by Searchfield (n.d.) match relatively well with those reported from other countries around the world. It is difficult to compare the Dawes and Welch (2010) data to the figures provided by the epidemiology studies mentioned above. The 6.6% of participants who experienced tinnitus "half of the time or more" may have been closer to the smaller proportion of people whose tinnitus significantly impacts their quality of life, instead of the larger percentage of individuals whose tinnitus is present but not bothersome.

It is evident that tinnitus is a prevalent issue around the world (Khedr et al., 2010), especially in those over 65 years of age (Lasisi et al., 2010; Michikawa et al., 2010). A smaller proportion of these individuals suffer from severe or debilitating tinnitus which affects their quality of life and can cause sleep and concentration difficulties (Kochkin et al., 2011), mental health disorders, decreased ability to tolerate sounds (Møller et al., 2010), and at worst, contribute to suicide (Searchfield, 2003).

1.6 Help-Seeking for Tinnitus

For a small proportion of patients, tinnitus significantly impacts their quality of life and results in them presenting for treatment. Although a study by Lockwood (2002) revealed that for individuals with tinnitus due to noise exposure, it can take around five to eight years following the onset of their symptoms to actually seek help.

It is likely that those with tinnitus who are suffering from a related or concurrent psychiatric disorder i.e. anxiety or depression, are more likely to seek help (Salviati et al., 2013). The overall perceived severity of tinnitus is related more closely to psychological and mental health factors than to audiometric factors. In a study by Salviati (2013) 68 out of the 156 adults with chronic tinnitus recruited suffered from a co-existing psychiatric condition. These included: bipolar disorder, obsessive-compulsive disorder, somatization disorder, cyclothymic disorder, anxiety disorder (not otherwise specified and generalized), dysthymia, and panic disorder.

Attias (1995) investigated the psychological profile of tinnitus patients who presented for management compared to those who did not. These two groups were further compared to a control group who did not suffer from tinnitus. It was revealed that the help-seeking group had the most severe psychiatric symptomatology, a more external locus of control, and lower coping abilities. Compared to the control group, the non-help seekers experienced a more severe psychiatric symptomatology more similar to the help-seeking group. The help-seeking group experienced louder tinnitus than the non-help seeking group.

1.7 Tinnitus Assessment

Upon presenting to clinic, before management strategies or treatment can commence individuals will first be assessed by their clinician. There are currently no known objective assessments to determine the presence and severity of subjective tinnitus, and as it usually has no accompanying physical signs the clinician can only rely on the patients' own description of their tinnitus (Møller et al., 2010). Tinnitus is frequently diagnosed based on previous medical history and an assessment of the effect it is having on the patient and their family (Baguley et al., 2013). If the tinnitus

is of a pulsatile nature it can potentially be detected via auscultation (Baguley et al., 2013).

Due to the lack of objective assessments of tinnitus, severity is commonly used to classify the disorder (Møller et al., 2010). Reed (1960) categorises tinnitus into three extensive subgroups: mild, moderate, and severe chronic tinnitus. With mild tinnitus everyday life is not noticeably affected, with moderate tinnitus there may be some annoyance and unpleasantness, whereas with severe chronic tinnitus the patient's life is completely affected (Møller et al., 2010).

Questionnaires are commonly utilised to help determine the effect of tinnitus. These include the Tinnitus Functional Index and the Tinnitus Handicap Inventory (THI) (Baguley et al., 2013). Negative psychological effects and hyperacusis are some of the associated symptoms of tinnitus and can also be evaluated with questionnaires. Audiometry and tympanometry should be completed. If patients present with neurological symptoms, or asymmetric hearing, or asymmetric tinnitus further investigation is required. If the tinnitus is pulsatile in nature and synchronous with the patient's heartbeat further assessment is also (Baguley et al., 2013).

As tinnitus can be due to many different underlying causes and is accompanied by various co-morbidities a multi-disciplinary team approach to diagnosis is ideal (Langguth et al., 2013). Visual analogue scales and loudness matching are commonly used in estimating the loudness of one's tinnitus (Møller et al., 2010). There have been developments in the use of functional imaging detecting abnormalities in brain regions for tinnitus patients although this is still being developed and not yet in use with this clinical population (Møller et al., 2010).

1.7.1 Treatments for tinnitus

As tinnitus is a prevalent and potentially devastating condition for a number of individuals across the world, it is important to provide appropriate treatment. The first step in managing tinnitus is by differentiating objective from subjective tinnitus, as those with objective tinnitus are hearing real sounds (Lockwood et al., 2002) and likely require different management approaches. The vast majority of cases are subjective tinnitus, for which there is no *cure*, as such, although there are a number of treatments available to assist in managing the condition. Generally, these work by decreasing the individuals' awareness of their tinnitus (Searchfield, 2003). The goal of eliminating the tinnitus completely is often impossible, however lessening its impact on the patients' quality of life may be more achievable and realistic (Møller et al., 2010).

There is a dearth of well-controlled, high-standard clinical trials for tinnitus management strategies (Searchfield, 2003). In response, there has been an increase in efforts being made to improve the quality of tinnitus management clinical trial studies (Kreuzer et al., 2013). A number of treatment studies demonstrated positive outcomes for individual participants, although not the whole study group. The heterogeneity of tinnitus and its many distinct subtypes are likely the reason why individuals respond in different ways to the various treatment methods (Tyler et al., 2008). Because of the lack of objective methods to determine the presence and severity of tinnitus, clinicians rely on their patients' own assessments of subjective tinnitus for assessment of treatment effectiveness. This is an issue because it is not possible to objectively measure how patients progress in treatment. Also, some patients may be unable to effectively communicate their symptoms. This may be especially true if they have

lower oral literacy skills, or have physical or mental difficulties preventing them from adequately expressing themselves.

The following section is a summary of Chapter Eleven: Evidence About the Effectiveness of Treatment Related to Tinnitus, from Evidence-based Practice in Audiology: Evaluating Interventions for Children and Adults with Hearing Impairment (Wong, 2012). This is an up to date evaluation of tinnitus treatments as of 2012 and contains: pharmacological treatments, hearing aids (HA), maskers, laser, magnetic and electrical stimulation, neuromonics, biobehavioural treatments, tinnitus retraining therapy (TRT), and cognitive behavioural therapy (CBT).

1.7.2 Pharmacological treatments

It has been shown that pharmacological treatments including anticonvulsants and local anaesthetics can have an immediate suppressing effect on some types of tinnitus (Kallio et al., 2008), although these effects do not last over time (Noble, 2012). A number of herbal and proprietary products used to treat anxiety or depression have also been suggested as potential tinnitus treatments, as well as other dietary supplements. According to reviews by Dobie (1999), Dobie, and Lannguth, Salvi, and Belen Elgoyhen as cited in Noble (2012) it appears that there is no direct lasting effect on tinnitus severity or presence of a vast number of pharmacological treatments that have been tested thus far. Baldo, Doree, Molin, McFerran, & Cecco (2012) reviewed the effect of antidepressants for tinnitus treatment across six randomized clinical studies meeting the inclusion criteria, although due to the differences between studies and generally lower methodological quality there were no hard conclusions drawn about tricyclics, although selective serotonin reuptake inhibitors may make tinnitus less annoying according to Robinson, Viirre, and Stein,

as cited in Noble (2012). Side effects such as sexual dysfunction, dry mouth, and sedation were frequently reported (Baldo et al., 2012).

1.7.3 Hearing aids

Hearing aids have been used in the treatment of tinnitus for a long time now, with a potential “subjective symptomatic improvement” in tinnitus masking in the high frequencies due to the introduction of digital hearing aids (Trotter & Donaldson, 2008, p. 1053). Amplification alone barely changes or does not change the tinnitus signal, only partially masks it (Moffat et al., 2009). Searchfield, Kaur, and Martin (2010) examined 58 tinnitus patients’ pre- and 12 months post-treatment Tinnitus Handicap Questionnaire scores, with half opting to use HAs, and half opting for short counselling sessions. The HA subgroup’s scores reduced significantly from 59% to 37%, where the counselling subgroup’s scores only decreased from 51% to 44%. When indicated i.e. when a hearing loss is present, open earmould coupling and broadband acoustic amplification could be beneficial. Noble (2012) concludes that there is strong evidence supporting further research into the use of hearing aids for tinnitus.

1.7.4 Maskers

As demonstrated in Folmer and Carroll’s (2006) study, masking devices are more favoured by tinnitus patients who do not have a coexisting hearing impairment. This makes sense, as low-level masking may be tolerable for patients without hearing loss to distract attention from the tinnitus, although if these sounds need to be increased to a high hearing threshold they may become aversive and interfere with communication (Noble, 2012). There is still insufficient information surrounding factors behind the acceptance and use of masking devices.

1.7.5 Laser

Directing a low-power laser at the cochlea through the ear canal has been found to have no effect on tinnitus severity (Mirz et al., 1999; Teggi, Bellini, Piccioni, Palonta, & Bussi, 2009). The evidence against this treatment's effectiveness is strong, as both studies used a placebo-controlled design, double-blinded, and with participants randomly assigned to either the laser treatment or a placebo.

1.7.6 Hypnosis, Relaxation training, & Biofeedback

Noble (2012) reports that the results from these treatments thus far have been inconsistent. Ross, Lange, Unterrainer, & Laszig (2007) administered hypnosis to 393 patients with tinnitus over 28 days, concurrent with music and relaxation therapy, and information regarding tinnitus. While a significant reduction in tinnitus-related distress over a period of time, it is not possible to determine what aspect(s) were responsible for the changes. In the case of relaxation training, and biofeedback, previous reviews by Noble, as cited in Noble (2012) and Dobie (1999) have suggested they have no effect, mixed effects, or borderline beneficial effects.

1.7.7 Neuromonics

This treatment combines broadband noise and filtered music with counselling. Noble (2012) notes that the original authors (P. B. Davis, Paki, & Hanley, 2007) completed a small independent study where the number of dropouts was as high as the number of participants who completed the study. For those that did persevere with the treatment, substantial reductions in Tinnitus Reaction Questionnaire scores were observed after eight months of treatment. However, as there are two components to

this treatment it is difficult to ascertain whether the counselling or music and broadband noise were the driver of the positive changes.

1.7.8 Magnetic and electrical stimulation

Repetitive transcranial stimulation has been gaining attention due to the argument that it may decrease overactivity in the auditory cortex, supposedly a sign of tinnitus (De Ridder, et al., as cited in Noble 2012). Anders et al., as cited in Noble (2012) noticed a slight difference between placebo and treatment groups in THI and Tinnitus Questionnaire (Hiller & Goebel, as cited in Noble, 2012). scores lasting for about fourteen weeks. Another topic of clinical research is the application of direct, low-level electrical stimulation sub-cranially. Tinnitus patients have reported a significant decrease in self-rated tinnitus-related distress and loudness after the activation of a cochlear implant (Van de Heyning, et al., as cited in Noble (2012), although rarely a worsening in tinnitus has been described (Summerfield, et al., as cited in Noble 2012). Vanneste, Plazier, Van de Heyning, & De Ridder (2010) used direct electrical stimulation to treat *somatic* tinnitus, resulting in a short-term yet statistically significant modest to substantial decrease in tinnitus for approximately 18% of the 240 patients included in the study. Friedland, Gaggl, Runge-Samuelson, Ulmer, & Kopell, as cited in Noble (2012) reported on the outcomes of eight unilateral tinnitus patients for the first twelve weeks of a one year in-depth treatment programme. While participants scored better on self-assessed measurements of tinnitus-related disabilities and depression, there were no meaningful changes in the psychophysical measures such as tinnitus loudness and frequency matching. It is possible that due to the short periods of total tinnitus suppression, participants experienced relief and a sense of hope, hence exhibited better self-assessment scores.

1.7.9 Cognitive behavioural therapy (CBT)

The goal of CBT is to promote habituation in individuals with tinnitus. CBT does not affect the tinnitus itself as such, but uses cognitive re-framing and decreasing stress to work towards better acceptance of the chronic condition. A Cochrane Review with Level 1 evidence was completed by Martinez-Devesa, Perera, Theodoulou, and Waddell (2010) who analyzed eight randomized controlled trials meeting inclusion criteria. Visual analogue scales, and tinnitus loudness were primary outcome measures, with QOL and depression self-assessments as secondary outcome measures. There was no difference between control and treatment groups in visual analogue scale, although there was a significant difference in tinnitus severity favouring the treatment groups and six out of eight trials demonstrated a significant improvement in depression for the treatment groups. Long-term follow up data was lacking in the literature reviewed.

1.7.10 CBT combined with Biofeedback

Weise, Heincke, & Rief (2008) suggested that biofeedback alongside CBT would help individuals with tinnitus who were sceptical of psychotherapeutic treatment alone. Electromyography was the biofeedback procedure used to help participants relax their muscles, and standard CBT protocol was used for the counselling component of treatment. Significant improvements in rated tinnitus loudness and tinnitus annoyance were observed, as well as improvements in wellbeing and self-efficacy. Low dropout rates and high satisfaction was reported. After further analysis of the changes biofeedback brought about in muscle control, Heinecke, Weise, and Rief (2009) found them to be significant alongside the psychological measures. The two types of changes were independent of one another,

thought to potentially be due to the biofeedback working well for participants with a more somatic orientation to their tinnitus, facilitating better receptiveness to the counselling component. Overall, Noble (2012) concluded that a combined CBT and biofeedback approach seems promising.

1.7.11 Tinnitus retraining therapy (TRT)

Only one study, Henry et al., (2009), truly followed original TRT protocols from Jastreboff and Hazell, as cited in Noble (2012), thus was included in the Cochrane Review by Phillips and McFerran (2010). The original protocol includes a combination of directive counselling where the clinician educates the patient about how tinnitus occurs and partial masking of the tinnitus signal. This study compared TRT to masking alone across two groups. Henry et al., (2009) found that over the 18 months of the study, the TRT group had a 3:1 improvement rate over the masking alone. The masking group significantly improved in THI scores up until three months, then trailed off over time. Approximately 25% of participants chose to wear a hearing aid. As hearing aids can potentially relieve tinnitus distress, a separate analysis for hearing aid and ear-level noise masker participants should have been included to analyze any confounding effects. Hiller & Haerkotter, as cited in Noble (2012) found similar benefits of patient education. The counselling instead followed the standard cognitive-behavioural therapy (CBT) formula. Some improvement in Tinnitus Questionnaire (Hiller & Goebel, as cited in Noble, 2012). A psychometric scores was found for the participants using partial masking only over eighteen months, although not to the degree of those using CBT instead. In addition, the participants using both CBT and partial masking displayed no incremental effects over the pure CBT participants. It seems the benefits from TRT may stem from the counselling

component. One improvement to these studies would have been control groups to demonstrate the natural time-course of tinnitus adaptation.

1.7.12 Summary of evidence base for tinnitus treatment

Currently, the evidence reveals a lack of a viable pharmacological treatment for tinnitus, and that masking-devices alone in the absence of hearing loss may be limited. Noble (2012) points out that either a physical approach or biobehavioural/psychological approach may be beneficial treatments for tinnitus. A physical approach aims to moderate or remove the tinnitus signal, such as with the TENS, and a biobehavioural/psychological approach utilizes effective acoustic amplification to mask the tinnitus, and CBT potentially with the addition of biofeedback. Treatments utilizing patient education, either through explaining how tinnitus arises or by helping individuals habituate to their tinnitus, have a stronger base of evidence to recommend them. It follows that clinicians need to provide this information in an easily understandable and usable way for their patients to help them achieve the best possible health outcomes.

1.8 Health Literacy

As the tinnitus treatments with the strongest evidence base primarily involve provision of information about tinnitus and counselling to promote acceptance of the condition it is imperative that patients have adequate health literacy skills. Adequate health literacy refers to having sufficient communication abilities and intelligence to be able to understand basic health information and make knowledgeable medical decisions (Ferguson, 2013; Hester & Stevens-Ratchford, 2009). According to Berkman et al. (2011) as cited in Atcherson et al. (2014) the following skills are

required for effective functioning in a health care setting: ability to utilize quantitative information i.e. inscriptions on medications, interpretation of food labels (numeracy), ability to understand print as well as find and infer information (print literacy/reading), and lastly the ability to listen and speak i.e. during a consultation with a health professional (oral literacy).

Deficits in numeracy and reading have been more thoroughly examined than the ability to understand and recall complicated and detailed health information presented orally (Roter, 2010). This is another area affected by low health literacy skills. When patients with lower health literacy skills are not provided information regarding their health conditions in an easily understandable way, it creates feelings of distrust, frustration, and keeps them uneducated about their health problem (Roter, 2010). These patients are more at risk than those with sufficient health literacy skills: they have less satisfying appointments with health professionals, experience acute embarrassment when they do not understand accurately (Parikh, Parker, Nurss, Baker, & Williams, 1996), and are therefore more likely to hide their deficits (Kendig, 2006) and less likely to request repetition or clarification. Overall, patients with low health literacy skills are not as assertive or involved in their own health care as those with adequate health literacy skills.

Below basic literacy skills are prevalent throughout the world. In the United States of America around 25% of the population have low literacy skills (Roter, 2010). The Australian Bureau of Statistics (2013) completed a nation-wide assessment of literacy skills where scores were grouped from one to five, one being the lowest level of literacy skills compared to five being the highest. The results revealed that around 44% of Australians had literacy abilities at the lowest two levels,

with 39% scoring at the middle level, and only 17% at the highest two levels. On a more global scale, the United Nations Educational, Scientific and Cultural Organization Institute for Statistics (2012) reported that in 2010 the world-wide the adult illiterate population was at 775.4 million, and the world-wide youth illiterate population was at 122.2 million (60.7% female and 39.3% male).

1.8.1 Health literacy in New Zealand

According to Kōrero Mārama (Ministry of Health, 2010), New Zealanders with a low level of health literacy have a higher chance of being admitted to hospital because of a chronic health condition, being injured at work as safety precautions were not understood, and of needing to access emergency services. These individuals have a lower chance of accessing preventative services such as screening, as well as a lower chance of effectively controlling their chronic health condition and understanding the medicines and treatment available.

There have been growing concerns around the lack of focus on health literacy as studies have repeatedly shown that health literacy can impact patients' health outcomes, leading to considerable health disparities (Ferguson, 2013). The Ministry of Health released a report in 2010, Kōrero Mārama, which reported on the health literacy level of a large sample of adults (7000) ages ranging from 16 years to 65 years. It stated that 56.2% of New Zealand adults have low health literacy skills that do not meet the minimum level necessary to meet the demands of daily life and work. Kōrero Mārama also reported that three out of four Māori women and four out of five Māori men have low health literacy skills and that across all demographics Māori consistently had poorer health literacy skills than non-Māori (Ministry of Health, 2010).

The Ministry of Health (2010) split health literacy into five skill levels over a scale ranging from 0 to 500. Levels one and two (0 to 275) indicated a poor level of health literacy skills, whereas levels three to five (276 to 500) referred to sufficient to excellent health literacy. The specific areas assessed were problem solving, numeracy, prose literacy, and document literacy. Across all age categories, and regardless of whether individuals were Māori or non-Māori, health literacy was low overall, indicating New Zealanders may struggle to cope with health literacy demands in everyday life. The results also indicated that sufficient health literacy skills (level three to five) increased by from the 16 to 18 years subgroup until the 40 to 49 years subgroup where it declined in the 50 to 65 years subgroup. This report did not comment on the health literacy skills in the older New Zealand population (above 65 years of age), which is unfortunate considering these are the very individuals who will likely need sufficient health literacy skills to effectively access healthcare services.

1.9 Patient Education

If over half of New Zealand adults do not have sufficient health literacy skills to meet the demands of daily life and work (Ministry of Health, 2010) it is crucial that healthcare services provide information at an appropriate level to facilitate understanding and successful use of the healthcare system.

The desire to learn is an important part of self-care. Spaeth (2011) states that patients are in their best health when: a) they have the desire to take care of themselves, b) they possess the services to do so, which encompasses their healthcare professionals, c) cost is not a barrier, d) they possess the knowledge of how to take care of themselves, and e) with everything in place, they do take care of themselves.

Therefore, having patients that are well-informed of their health conditions and the subsequent management will promote better health outcomes.

Another relevant point Spaeth (2011) brings up is that education means to lead forth, not to fill up with too much information for patients to take in. While having a better understanding of a patient's medical condition is useful to a point, if educating patients is going to be worthwhile it should improve their overall quality of life (Feudtner, 2001). The main outcome measures of patient education should be linked to what the patient wants from their health care (Feudtner, 2001). For instance, instead of increasing knowledge about one's medical condition, the focus could be on decreasing anxiety due to said medical condition or increasing self esteem.

Feudtner (2001) organized the proposed outcome measures into a model which demonstrates the goals of patient education (Figure 1) which are applicable to various areas of health care for adults and children (Feudtner, 2001). These aims all interlink and the achievement of one can assist in accomplishing another.

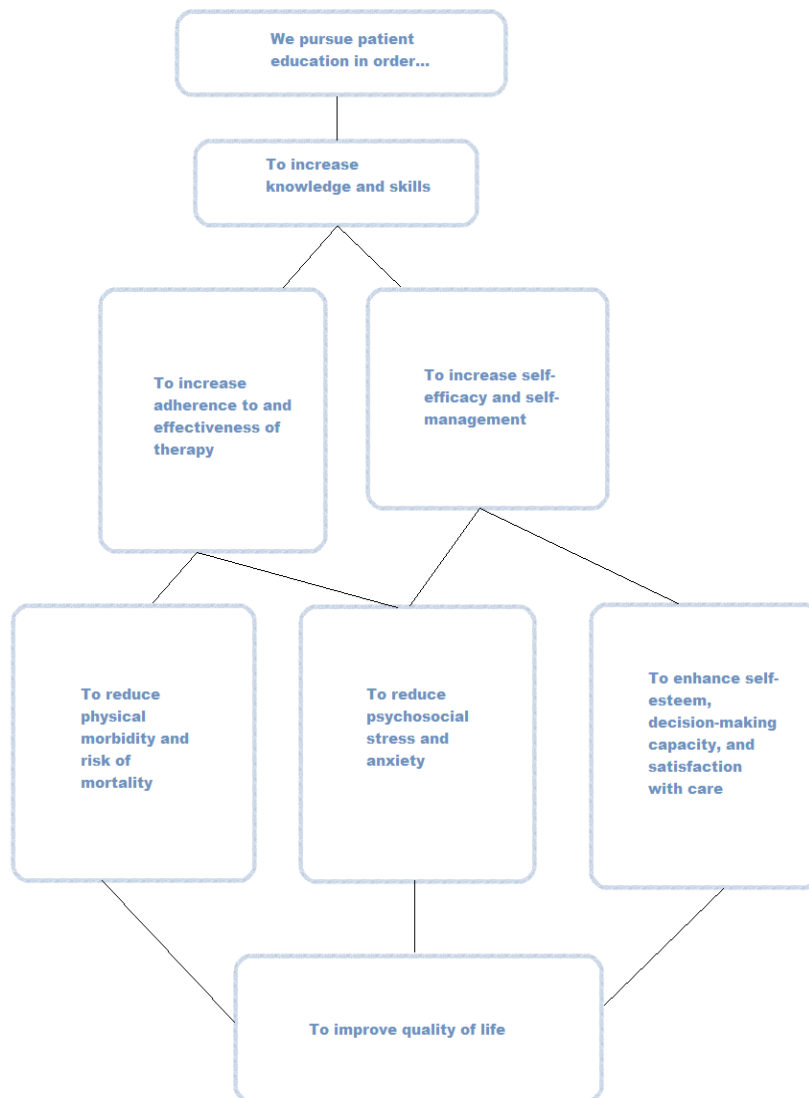


Figure 1. ‘Model to determine the objectives of patient education’ used with permission from Feudtner (2001).

In the area of tinnitus, it is suggested in the Clinical Practice Guideline: Tinnitus by Tunkel et al., (2014) that clinicians ought to provide patient education to their clients with ‘bothersome’ tinnitus regarding management available. Even though it is not the case, a number of patients are told that nothing or very little can be done to help with their tinnitus. While there is no cure for tinnitus at this time there are a number of management options available. Clinicians should steer clear of declarations that increase anxiety and negative feelings about tinnitus, for example: "You’ll just

have to learn to live with it." Some patients are not well-informed and may feel desperate enough to try any treatment that seems legitimate.

It should be explained that tinnitus is not a dangerous disease, but a symptom. Counselling should also cover lifestyle factors that may reduce or exacerbate tinnitus. Patient education should include the relationship between hearing loss and tinnitus, as well as information regarding hearing protection from excessive noise. Self-help books and brochures can be provided, to help patients become more informed about tinnitus. Clinicians should empower the patient to be able to actively participate in the decision-making around awareness of the natural history, prognosis, and management options.

1.10 Readability

For English-speaking adults in America, the average reading comprehension level is approximately at the seventh- to eighth- grade level (Kutner, Greenberg, Jin, Paulsen, & White, 2006); therefore, to facilitate health literacy it has been suggested that patient health material be written at fifth- to sixth- grade reading level (Weiss & Coyne, 1997). This would not only be helpful for readers with low health literacy; materials with a lower reading level are favoured by all readers (Weiss & Coyne, 1997). Most commonly, the reading level for documents is assessed by determining their *readability*. The readability of print material refers to the ease with which it is read with consideration to the writing style used, and can be influenced by design features of the print material. These features can include: spacing of font, size of font, visual appeal, personalization for the reader, colours used, organization and flow (Eames, McKenna, Worrall, & Read, 2003).

Various readability measures may be used for predicting the reading grade level (RGL) in US grade level necessary to easily read print material (Mumford, 1997). Readability measures often analyze sentence length, number of words that are in common use, as well as word length. Readability measures are frequently utilized for assessing health information (Sullivan & O'Connor, 2001).

The following readability formulas pertinent to the present study will be explained below: Flesch Reading Ease Formula (FRE), The Gunning's Fog Index Readability Formula (FOG), the SMOG, and the Flesch-Kincaid Formula.

1.10.1 Flesch Reading Ease Formula (FRE)

In 1948, Rudolf Flesch created a two-part readability formula called the Flesch Reading Ease (FRE) formula. The first part uses two variables, the amount of sentences within each 100-word sample, and the amount of syllables. The FRE Formula takes into account the average sentence length, and average number of syllables per word to derive a score. The reading ease is scored from 1 to 100, with 70 being "easy" and 30 being "very difficult". The second component of the readability formula calculates the human interest likely to be achieved by adding the number of personal sentences (e.g. exclamations) and personal words (e.g. pronouns) (DuBay, 2004).

1.10.2 The Gunning's Fog Index Readability Formula (FOG)

In 1952 Robert Gunning published a readability formula for adults in *The Technique of Clear Writing* named the FOG Index (Gunning, as cited in (DuBay, 2004; Gunning, 1952). The FOG Index utilizes the number of words with over two syllables for every 100 words and the average sentence length (DuBay, 2004).

1.10.3 Flesch-Kincaid (F-K)

Kincaid, Fishburne, Rodgers, and Chissom, as cited in DuBay (2004) created and validated the Flesch-Kincaid Formula which is the simplified version of the FRE formula and has been translated into reading grade level. The validation was measured on Navy materials by evaluating learning time and comprehension of the training manuals. The Flesch-Kincaid takes into account the average sentence length, and average number of syllables per word to derive a grade level for the material.

1.10.4 Simple Measure of Gobbledygook (SMOG)

The simple measure of gobbledygook (SMOG) formula was published by G. Harry McLaughlin in 1969, as cited in DuBay (2004). McLaughlin thought that sentence and word length ought to be multiplied instead of added. The SMOG formula looks at the number of polysyllables (words with more than two syllables) in 30 sentences. The SMOG formula was validated with the McCall-Crabbs passages with a 100 percent correct criterion. The SMOG classifies RGLs based on 100% comprehension, and is preferred by many health researchers who justify that even small miscomprehensions in healthcare settings can have significant implications for patient well-being (D'Alessandro, Kingsley, & Johnson-West, 2001; Shoemaker, Wolf, & Brach, 2014; Wang, Miller, Schmitt, & Wen, 2013).

1.11 Readability in Audiology

Many healthcare disciplines, including otolaryngology (Greywoode, Bluman, Spiegel, & Boon, 2010), speech pathology (Aleligay, Worrall, & Rose, 2008), and audiology (Laplante-Levesque, Brannstrom, Andersson, & Lunner, 2012), analyse the

readability of documents. Unfortunately, the bulk of the analysed documents for speech therapy and otolaryngology have been written above ninth grade reading level.

Questionnaires related to patient-reported tinnitus outcomes and listening difficulties associated with Central Auditory Processing Disorder (CAPD) were analyzed with the FRE, FOG, and FORCAST readability formulas (Atcherson, Richburg, Zraick, & George, 2013; Atcherson, Zraick, & Brasseur, 2011). According to the FORCAST, all resources exceeded the recommended fifth to sixth grade reading level, whereas the FRE and FOG analyses found highly variable results between the upper fourth to twelfth grade reading level. This indicates that patient questionnaires in audiology are not taking patients' health literacy level into account and not promoting understanding of the material being presented.

The vast majority of studies analysing readability for healthcare have revealed that patient documents exceed the recommended levels, which may result in patients with lower literacy skills being unable to access and process the health information contained in these documents. This, in turn, may lead these patients to take a less active role in their healthcare or fail to seek help (Atcherson et al., 2014).

More recently, Atcherson et al. (2014) examined web-based speech and language pathology and audiology related patient information on the American Speech-and-Language-Hearing Association (ASHA) website using the FOG, FORCAST, FRE, and F-K and found that 85.4% out of 225 documents analyzed exceeded the fifth to sixth grade reading level recommended for patient resources. This further substantiates the need to consider functional patient health literacy levels when developing and providing patient education materials as the current resources do not meet the recommended fifth to sixth grade reading level. Laplante-Levesque

(2012) evaluated the readability of English-language Internet resources for hearing-impaired adults with the SMOG, FRE, and the F-K Grade Level. It was discovered that, on average, people needed eleven to twelve years of education to understand and read the information presented.

The reading grade level of verbal and written communication between health professionals and patients within an audiology-specific context has also been examined (Nair & Cienkowski, 2010). Twelve participants with mild to moderate sensorineural hearing impairment were selected at random and saw one of three audiologists for a routine hearing aid orientation appointment. Communication samples (approximately 40 minute sessions) were videotaped, transcribed, and then analyzed via the F-K grade level formula from the appointments and the hearing aid brochures provided. The patients' predicted health literacy levels all fell below third grade reading level, whereas the audiologists' level of language significantly differed from their patients. It was also evident that the level of language audiologists used did not change regardless of differing patient demographics.

This study indicates that patients' health literacy may be lower than their functional literacy, and that there is still a communication gap in regard to patients' comprehending counselling sessions and in the understanding of patient education materials such as hearing aid brochures (Nair & Cienkowski, 2010). This is significant because if the communication interchanges and patient education materials are at too high a level for patients, they may not initially comprehend or be able to successfully retain the information over time. This may impact their ability to use and benefit from their management option e.g. hearing aids. Hearing impacts on many

aspects of patients' lives, and it is important for them to be able to successfully access the healthcare system.

1.12 Suitability

In Doak, Doak, and Root's (1996) textbook, *Teaching Patients with Low Literacy Skills*, chapter four (titled *Assessing Suitability of Materials*) the concept of *suitability* of print materials for patients is discussed. The authors suggest using at least one of three methods to assess new patient materials before presenting them to patients. The methods are: a) Assessment Checklist of Attributes, b) readability measures, and c) 'Suitability of Assessment Materials' (SAM), a suitability measure developed by the authors.

The Assessment Checklist of Attributes can act as a screen, with only seventeen items, and covers organization, writing style, appeal, and appearance of the patient material. The readability formulas evaluate narratives and running text, and tend to rate material with a greater number of multi-syllabic words and longer sentences as more difficult hence having a higher RGL. The readability of documents helps provide more information about the overall suitability of the material for a patient population. Some other factors to consider when assessing the suitability of material is the number of concepts within a paragraph, whether the context is familiar to the reader, whether there is a strong contrast between the writing and background, and the general appearance of the document i.e. length of the document.

The authors developed SAM to provide a method for health-care professionals to assess patient material in a systematic and timely fashion. The validation of SAM was completed across over 170 health care facilities from many cultures. SAM may

be utilized for assessing the suitability of print material, pictures, audiotape, and video. SAM provides a percentage score falling in one of three groups: not suitable (0-39%), adequate (40-69%), or superior (70-100%). The whole process should take roughly half an hour to 45 minutes, and evaluation occurs across 22 factors. The general categories scored on the SAM are: a) content, b) literacy demand, c) graphics, d) layout and typography, e) learning stimulation, motivation, and f) cultural appropriateness.

In phases II and III of their study, Shieh & Hosei (2008) used the SAM to evaluate 15 Healthy Start programme patient information materials including topics such as pregnancy, breastfeeding, and food safety. The types of materials used included brochures, an information card, and single page fliers developed by a company, non-profit organizations, local or federal health agencies, and hospitals. Materials were each graded by 2 to 3 nursing students and an average SAM score was calculated. Interrater reliability was relatively high at .73. Overall, the patient materials achieved an adequate rating (mean = 66.5%), ranging from adequate to superior (range = 50.1% to 84.7%). Areas where the less suitable materials fell short were lack of summary, and problems or questions for the reader, as well as also scoring poorly on readability measures.

There is a dearth in suitability studies in audiology at this time, although Caposecco, Hickson, and Meyer (2014) included the SAM in their analysis of the readability, content, and design of hearing aid brochures to establish suitability for older adults. Four hearing aid guides which are available online from nine different manufacturers were examined. Overall, the hearing aid user guides achieved an adequate rating (mean = 52%, scores ranged from 40 to 68%), consistent with Sheih

& Hosei (2008). However, twenty-five out of thirty-six guides were given a not suitable rating due to their high readability levels (above or equal to ninth grade) as measured on the FRE, Fry Readability Graph, F-K, and Fog. This finding is consistent with the literature, as many of the patient education materials in audiology and health care in general exceed the recommended RGL.

1.13 Recall

As well as examining the readability and suitability of written patient information, it is also important for researchers to investigate whether health professionals are providing verbal health material in an appropriate way for their patients so that they can remember and process the information effectively. Medical research has found that patients forget approximately 40 to 80% of what health care professionals tell them immediately, and half of what is recalled is incorrect (J. L. Anderson, Dodman, Kopelman, & Fleming, 1979). A number of factors can influence the amount of information that patients remember. Kessels (2003) reported that increased age and anxiety reduces the amount of medical information people remember. The larger the amount of information presented the less the amount patients will retain (McGuire, 1996). Patients also tend to remember diagnosis-related information more easily than treatment information (Kessels, 2003).

There has been little research in this area in audiology; however in other medical professions patient recall studies are much more common. Cameron (2013) provided patients with written information about the flu and found that they correctly recalled 4.49 true/false items out of 15 total items. Jansen (2008) investigated how well older cancer patients recalled medical information. Out of 82.2 items discussed on average, the percentage correct for information recalled by the older patients was

approximately 20% for open-ended questions, 70% for competition items, and 80% for multiple-choice questions. Lewkovich (2005) analyzed the amount of information patients who received cervical spine manipulation could remember about their session and found that patients recalled the procedure with low accuracy. Patients tend to recall more information correctly if tested with multi-choice questions, although to gain better insight on how much the patient actually remembers open-ended questions are likely to be better measures.

1.13.1 Age

Kessels (2003) explains that while it is generally assumed that older adults tend to recall less information correctly than younger adults, some types of memory are more affected by ageing than others. Memory for episodic information (e.g. the medical information doctors tell their patients) is subject to age-related loss, although memory for general semantic information (e.g. knowing who the current prime minister is) and for skills (e.g. riding a bicycle) is preserved. Morrow, Leirer, Carver, Tanke, & McNally (1999) explored how ageing affects memory for information related to their medical appointments via an automatic telephone message system and the older patients remembered less information correctly than the younger patients.

It may be that older adults have a decreased ability to structure medical information to recall at a later date (Kessels, 2003). This theory was investigated through showing a younger and older group of adults videotapes with information about osteoarthritis (McGuire, 1996). The videotapes presented either contained structured or non-structured information, with the non-structured variant more closely resembling how information is given in a clinical context. However, whether the information was structured or non-structured made no difference to recall. While the

younger group did remember more information correctly compared with the other group although there was no difference in the amount of information recalled over time.

Another hypothesis was that the ease with which information is remembered in older adults relates more to whether the new information is in line with previous beliefs (Hess & Tate, 1991). Rice & Okun (1994) observed that in older adults, written medical information which validated previous knowledge or beliefs was recalled more easily than information opposing those beliefs. This can be further explained by the concept of *schemas*. Cognitive schemas are personal theories that a patient has about their disorder which can sometimes be misconceptions. Information disproving these schemas may be more easily forgotten than new information. In older patients, it is more difficult to remember for extended periods of time especially for medical information disproving pre-existing schemas (Kessels, 2003).

1.13.2 Anxiety

Another factor which can affect patients' ability to recall medical information is anxiety or distress. Following cognitive-psychosocial experiments it has been found that state-dependent learning and attentional narrowing are relevant phenomena for patients in a clinical context (Kessels, 2003). State-dependency refers to when the amount of information that can be recalled relies on the congruity of the emotional or physical state during the appointment and when the patient is required to recall said information. Therefore, if a patient is anxious when being presented with medical information, they will recall best under similar conditions (Schramke & Bauer, 1997). An implication of this may be that when an adult is provided medical information regarding treatment in a stressful state in a clinical context, they forget much of this

information in a relaxed environment at home where the information is most applicable. Too much or too little anxiety can result in worse memory performance, so a moderate level of anxiety is ideal (Ley, 1979). Attentional narrowing refers to when a central message (e.g. diagnosis of a chronic illness) becomes the main focus for a patient, and more peripheral information such as treatment adherence cannot be retained or recalled (Ley, 1979).

1.13.3 Perceived importance

A third element which can affect how well patients remember is how important the information is to them subjectively. Medical information regarding diagnosis is regarded as more important than information associated with treatment (Kessels, 2003). The amount of information recalled correctly is closely associated to the perceived importance of the information. Patients perceive information as more important if it is explained in specific instead of general language. For example, by saying ‘you must take two weeks off work’ instead of ‘you should rest for a while’ (Bradshaw, Ley, & Kinsey, 1975). The more simple the language used by a health professional the better it will be remembered, and hence recalled correctly (Kessels, 2003). While organising information logically does not increase the amount of information patients remember, explicit categorisation can assist recall. If the health professional explicitly states what will happen and its order, this can increase recall. For example, the health professional could start with the problem, then the necessary tests, what will likely happen, likely treatments, and how the patients can help themselves (Kessels, 2003).

1.13.4 Modality of information

Kessels (2003) also describes how the modality of medical information has an effect on recall. The majority of medical advice is presented orally, although Thompson, Cunningham, & Hunt (2001) suggest that this should be supplemented with written and/or visual information to support understanding and retention. Blinder, Rotenberg, Peleg, & Taicher (2001) found that, following minor oral surgical procedures, nearly 70% of patients did not comply with postoperative instructions regarding antibiotics, and 40% did not remember being given written and oral instructions were given in the first place. Henceforth, they advised simple language with details for verbal and written instructions.

A difficulty with written instructions or patient material is to keep the language and content at an appropriate grade level for patients with low health literacy and for non-native speakers (Kessels, 2003). The addition of visual material can help compliance and recall, especially for those with a lower education (Delp & Jones, 1996). Other studies have found that simple pictographs alongside verbal instructions can be very effective to facilitate recall of medical information for significant periods of time (Houts, Witmer, Egeth, Loscalzo, & Zabora, 2001).

1.14 Recall in Audiology

Watermeyer, Kanji, & Cohen (2012) used semi-structured interviews and qualitative analysis to assess caregiver recall directly following audiological assessment which found that while four out of the five caregivers managed to correctly remember the final diagnosis and audiologist recommendations, a considerable amount of information was not retained. Four separate audiologists

provided information to clients around the audiogram, hearing, diagnosis and further recommendations. Caregivers had particular difficulty remembering information regarding the audiogram, the hearing mechanism, and the various tests completed during the session. It may be that caregivers more accurately remembered the information that was perceived as the most important to them (Kessels, 2003), likely their child's diagnosis and the subsequent steps that need to be taken. It is interesting, however, that the audiologists' main focus was on educating caregivers about hearing and tests completed during the session. This is a mismatch here, and this highlights the need for audiologists to cater their feedback to the individual caregiver or clients' health literacy level and to consider what it is they want to take away from the appointment.

Reese and Hnath-Chisolm (2005) and Reese and Smith (2006) investigated the amount of information new hearing aid wearers could recall successfully from their hearing aid orientation (HAO) appointment both immediately after the initial session and one month later. Reese and Smith (2006) utilized a 25-item open-ended recall quiz whereas Reese and Hnath-Chisolm (2005) provided participants a 35-item multiple-choice test, both containing information from the initial appointment. Directly following the HAO participants on average recalled approximately 75 to 80% of the information successfully. Delayed recall at four weeks demonstrated that the majority of the information was retained across both studies. The mean recall score for Reese and Hnath-Chisolm (2005) was 78%, a 4% improvement, where the mean recall score for Reese and Smith (2006) was 77%, a 3% reduction from the first appointment. Reese and Smith (2006) noted that even though a considerable amount of information about the care and use of hearing aids was remembered, important information was forgotten by a number of participants most notably feedback

information and multiple memory function information. Reese and Hnath-Chisolm (2005) also examined whether the amount of information remembered differed as a function of the audiologist providing the information, the patients' age, severity of hearing loss, and prior knowledge of hearing aids. Participants that remembered more information at their initial appointment retained more at four weeks. Age was not found to be a factor associated with recall ability, although hearing loss was associated with poorer recall immediately after the initial appointment. Unsurprisingly, prior knowledge regarding hearing aids helped recall ability.

Currently, there are no published studies examining the recall of information in a tinnitus counselling session. However, as the literature suggests that patients do not accurately recall some important information from their appointments, especially if they are experiencing a heightened state of anxiety (which is probable in the case of a tinnitus counselling session), it is important to assess.

1.15 Summary

Tinnitus may be of a subjective or objective nature, although subjective tinnitus where only the patient perceives sound is far more prevalent (Møller et al., 2010). The causes of tinnitus are widely varying and can include ageing (Eggermont & Roberts, 2004), head trauma, auditory nerve damage, noise exposure, or drugs (Pirodda et al., 2010). The biggest risk factor for tinnitus is hearing loss (Baguley et al., 2013). While for most tinnitus is manageable in daily life, for others it significantly impacts their quality of life. For some individuals it can be associated with hyperacusis or affective disorders (Møller et al., 2010).

Tinnitus has a world-wide prevalence of approximately 10 to 15% (Andersson et al., 2005; Baguley et al., 2013; A. Davis & El Rafeaie, 2000; Kreuzer et al., 2013), and in New Zealand affects around 15 to 20%. Although for roughly 1% of New Zealanders tinnitus is debilitating (Searchfield, n.d.). Tinnitus is often assessed through the use of questionnaires such as the tinnitus handicap inventory and tinnitus functional index (Baguley et al., 2013). The literature regarding the treatment of tinnitus suggests that counselling-based treatment approaches which help patients by explaining how tinnitus arises or by helping individuals habituate to their tinnitus, have a stronger base of evidence to recommend them.

For successful management patients require adequate health literacy skills and the clinicians need to take into consideration the patients' health literacy abilities when providing services. In New Zealand, 56.2% of adults aged 16 to 65 have low health literacy skills (Ministry of Health, 2010). Poor health literacy skills will impact how well patients understand and participate in health care services, including the audiology sector. Ensuring verbal communications and written health care materials are at an appropriate readability level, no higher than 5th to 6th grade reading level (Weiss & Coyne, 1997), and an appropriate suitability level will facilitate more effective patient education.

Patients forget approximately 40 to 80% of the information health care professionals tell them, and over half of the information recalled is incorrect (J. L. Anderson et al., 1979). A number of factors, such as older age and higher anxiety levels can further impact what patients remember (Kessels, 2003). In the audiology sector, there are very limited studies available examining patient recall. While it seems that new hearing aid patients (Reese & Hnath-Chisolm, 2005; Reese & Smith,

2006) and caregivers (Watermeyer et al., 2012) may remember some of the information from their appointments, pertinent points are still missed. There are no studies at this time focusing on the recall of tinnitus patients following initial consultation with an audiologist.

1.16 Study Aims

Based on the review of the literature there are two key topics that arise: evaluating and improving patient education material and recall of information from a tinnitus counselling session.

To address the challenge of improving patient education, the first aim was to examine the readability and suitability of two tinnitus patient education brochures provided by the clinic to new tinnitus patients. If the readability of the brochures were higher than fifth to sixth grade reading level then an attempt to rewrite a portion of the material to a suitable readability level would be made.

To address the question of patient recall of tinnitus information, the second aim was to investigate a) the amount of information tinnitus patients' can successfully recall directly following their initial appointment, b) the amount of information that is retained one to two weeks following their appointment, c) whether the amount of information recalled is related to patient variables, and d) the themes that arose from interviews with the patients.

To examine the first study aim, the following research questions were addressed:

- a) What is the reading grade level of two tinnitus information brochures which are provided to tinnitus patients who receive an initial counselling session?
- b) What is the suitability of two tinnitus information brochures which are provided to tinnitus patients who receive an initial counselling session?

To address the second study aim, the following research questions were addressed:

- c) What information do tinnitus patients accurately recall directly following their initial counselling session?
- d) What is the relationship between the amount of information accurately recalled immediately and demographic variables (age, level of qualification), and audiometric variables (previous hearing aid use, degree of hearing impairment, tinnitus reaction scores, and tinnitus severity)?
- e) What information do tinnitus patients accurately recall in the short-term (one to two weeks following the initial appointment)?
- f) What is the relationship between short-term recall and demographic variables (age, level of qualification), and audiometric variables (previous hearing aid use, degree of hearing impairment, tinnitus reaction scores, and tinnitus severity)?

- g) Is there a significant difference in what patients correctly recall immediately following the initial counselling session and what they correctly recall in the short-term?
- h) What themes arise from the interviews immediately following the initial counselling session?
- i) What themes arise from the interviews conducted 1- 2 weeks after the initial counselling session?

Chapter 2

2.1 *A Priori* Sample Size Analysis

This study was a single-group repeated-measures design. Based on this design, using an alpha-level of $p = .05$, a power level of $1 - \beta = .80$, and a clinically significant effect size of Cohen's $d = 1.0$, the minimum number of participants necessary to detect a "clinically significant" improvement in recall of information would be seven.

2.2 Participants

A clinical audiologist at one private hearing aid clinic in Christchurch, New Zealand prospectively identified eight participants. There were three females and five males included in this study, with a mean age of 55 years. The ages ranged from 31 to 84 years. On average, participants attended school for 11 years. The years of schooling ranged from 8 to 13 years. Seven out of eight participants had hearing loss, ranging from normal hearing to severe hearing loss, although only one participant reported a history of hearing aid use. Five participants reported a family history of hearing loss, and three reported a family history of tinnitus.

Six participants described their tinnitus as coming from both ears, with the remaining two describing their tinnitus as originating from the centre of the head. The mean self-rated tinnitus loudness score (1 = very soft, 10 = extremely loud) was 6.06 and the mean self-rated tinnitus annoyance score (1 = not at all, 10 = a lot) was 6.53. The mean duration of tinnitus was 7.37 years. Participants' descriptions of their tinnitus included: cicadas, mid or high-pitched ringing, high-pitched tone, buzzing, humming, and screaming.

Participants were required to meet the following inclusion criteria: 1) adults over the age of 18, 2) present with tinnitus as their primary complaint, 3) consult for services at the private hearing aid clinic where this study was completed, 4) willing to participate in a short, digitally recorded interview and complete an information questionnaire immediately following their initial tinnitus assessment, 5) willing to participate in a second short, digitally recorded interview either on the telephone or immediately prior to their second tinnitus appointment. There were no inducements offered in this study, nor any advertisement in the community. All clients at the clinic who met these inclusion criteria were invited to take part in the study by the audiologist.

2.3 Procedures

2.3.1 Study Aim 1

2.3.1.1 Readability

Readability analyses were performed on two tinnitus brochures. Brochure 1 was always provided to patients suffering from tinnitus at the private hearing aid clinic. Additionally, Brochure 2 is a more detailed brochure that is provided to some tinnitus patients. It was also examined to ensure all material that may have affected recall was included. The content of both brochures was converted into Microsoft Word 2007 documents. Then, the Word documents were analysed using the Readability Studio version 2012.1 (Oleander, 2013) software program. Brochure 1 was revised with the aim of reducing the readability level to a suitable level while maintaining the same content. The revision of this brochure focused on simplifying

jargon or difficult multi-syllabic words, using the word ‘sounds’ instead of tinnitus, and shortening sentence length. Two examples of revisions are displayed below.

Brochure 1: How does Tinnitus become a problem? Some people find their Tinnitus does not go away, or it gets worse. In some cases it may become so severe that they find it difficult to hear, concentrate or even sleep.

Revised Brochure 1: How do these sounds become a problem? Some people find that these sounds do not go away, and may get worse. Sometimes they find it hard to hear, think, or sleep.

Brochure 1: Counselling programs have an educational component to explain what goes on in the brain that causes Tinnitus. They are designed to help change the way sufferers think about and react to Tinnitus.

Revised Brochure 1: Counselling programs teach people what goes on in the brain that causes the sounds in their head. They are designed to help change the way people think about and respond to these sounds.

The content of the revised brochure was evaluated by an audiologist who has worked in the area of tinnitus management for 37 years. The audiologist was asked to comment on whether the revised brochure and the original brochure contained the same content. Readability analyses were performed in the same manner on the revised brochure. The initial readability analysis of Brochure 1 and Brochure 2 are displayed in Figure 2.

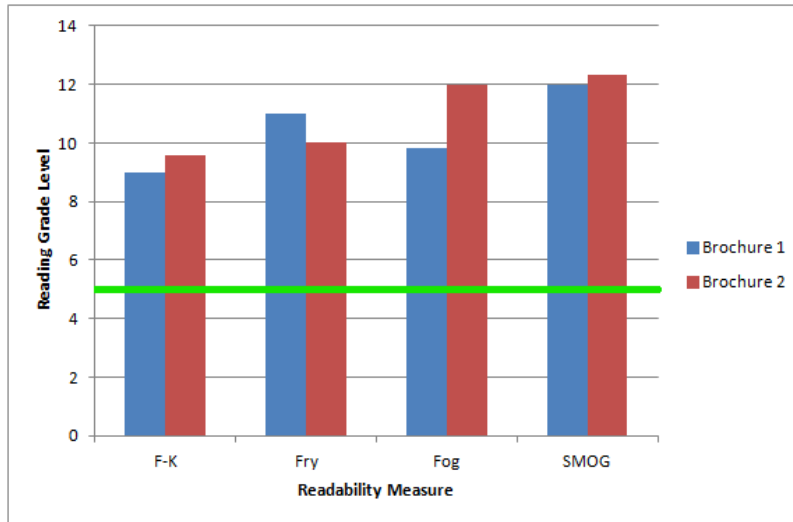


Figure 2. *Readability analysis for patient education brochures*

Note. F-K = Flesch-Kincaid, FOG = Gunning’s Fog Index Readability Formula (FOG), SMOG = Simple Measure of Gobbledygook (SMOG). The green line illustrates the internationally recommended reading grade level (Weiss & Coyne, 1997) for documents intended for general consumption.

With the goal of reducing the readability estimate to the 6th RGL, using the F-K formula, the average sentence length of the brochure would need to be reduced to 6.6 words in length (keeping the average syllables per word constant). Conversely, if the average sentence length were held constant, the average syllables per word would need to be reduced to an impossible -.36. Clearly, a combination of modification techniques is required to achieve the desired RGL of 6. In addition, to be in line with

best practice guidelines, the number of long sentences and passive sentences also needs to be reduced.

2.3.1.2 Suitability of Materials (SAM)

There were 2 SAM raters: Rater 1, a research audiologist with 17 years of clinical experience in adult rehabilitation and Rater 2, a research audiologist with 13 years of clinical experience in adult rehabilitation. Both raters have previously read the material on SAM, trained on non-study material, and rated the brochures independently.

2.3.3 *Study Aim 2:*

All participants gave informed consent prospectively. Verbal consent was obtained by the clinician, and written consent was acquired by the researcher. After consent was gained from the participants meeting the inclusion criteria, the researcher was invited to the clinic premises to complete the information questionnaire (Appendix 1) and record the interview to assess patient recall following their initial tinnitus assessment.

Prior to the initial tinnitus assessment, participants completed the Tinnitus Reaction Questionnaire (Wilson et al., 1991). Participants verbally completed the information questionnaire (Appendix 1) directly following initial tinnitus assessment. The researcher administered the information questionnaire (Appendix 1) to obtain demographic, hearing, hearing aid, and tinnitus information. Additional participant information was supplied by the audiologist. This information included: appropriate treatment/s for each participant, aetiology, TRQ scores, diagnostic hearing and tinnitus assessment information.

In order to assess immediate recall of information, the researcher conducted an interview with the participants immediately following their initial tinnitus assessments. Participants were asked seven questions (Appendix 2) about material the audiologist discussed during their session. The answers provided by the participants were digitally audio recorded on an Olympus digital voice recorder WS-833. Notes were taken by the researcher during the interview. The interview was completed with only the participant and the researcher present in a quiet room that was private. The first set of interviews ranged in length from 5 minutes and 23 seconds to 16 minutes and 45 seconds, with an average of 9 minutes and 49 seconds. The second set of interviews were on average 6 minutes and 55 seconds in length, ranging from 2 minutes and 30 seconds to 15 minutes and 20 seconds. A marking guide for the interview was provided by the audiologist who conducted the initial tinnitus assessment.

In order to assess short-term recall of information, the researcher conducted a second interview with participants immediately prior to their follow-up tinnitus appointment. If participants did not return for a follow-up appointment, the researcher conducted a phone interview instead. The interview contained the same seven questions and the same marking guide was used to assess recall. The follow-up interval ranged from 7 days to 18 days (mean = 11.75). The time interval between the initial and the telephone interviews ranged from 12 days to 18 days (mean = 15.25 days). A total of 4 follow-up interviews were conducted face-to-face and 4 follow-up interviews were conducted telephonically.

Major themes in participant answers were analysed for Questions 6 and Question 7 from the first and second interview. Question 6 was 'What is the main

thing you have learnt today?’ and Question 7 was ‘How are you feeling about your tinnitus now that you’ve had your appointment?’ The full set of questions may be found in Appendix 2.

2.4 Measures

2.4.1 Study Aim 1

A total of 4 readability formulas were used to assess the readability of the tinnitus brochure and its revision. The formulas used for this study were: FORCAST, Flesch-Kincaid grade level (F-K), Flesch Reading Ease Formula (FRE), and the Gunning’s Fog Index Readability Formula (FOG). The FORCAST, F-K, and FOG all report readability in US grade level, with a 5th - 6th US grade level being the recommended level for patient education material. A higher reading grade level indicates material that is more difficult to read, with a lower reading grade level indicating more easily read material. The exception is the FRE, which reports readability on a scale of 0 to 100, with higher scores indicating easier reading.

Each factor on the SAM is rated on a scale of 0 to 2. If the factor is not adequate, it is given 0 points, if it is adequate, it is given 1 point, if it is superior, it is given 2 points. The total points are added and divided by the number of possible points. The number of possible points may vary from material to material as some factors may not be applicable. In this case, the element “cultural images and examples” was omitted as it was thought to not be appropriate. There were a total of 21 factors rated, with a total possible score of 42. Scores ranging from 0 – 39% are considered not suitable for patient education. Scores ranging from 40 – 69% are considered adequate, and scores above 70% are considered superior patient education

material. The criteria to earn a superior rating for each factor as well as the possible points are shown in Table 1 and Table 2.

Table 1. Criteria required for a ‘superior’ rating on the Suitability of Materials (SAM)

Factor	Superior Rating
Content (8)	<ul style="list-style-type: none"> • Purpose is explicitly stated in title, cover illustration, introduction. • The material mainly focuses on application of knowledge/skills aimed at desirable reader behaviour rather than facts. • Scope of material is limited to essential information directly related to purpose. • Summary is included that retells the main message in different words using examples.
Literacy demand (8)	<ul style="list-style-type: none"> • 5th grade reading level or below • Uses simple sentences in a conversational style with active voice. • Uses common words, technical, concepts, and value judgement words used with explanatory examples, uses imagery words. • Provides context before new information. • An organiser precedes topics.
Graphics (10)	<ul style="list-style-type: none"> • Cover graphic is friendly, attention-getting, and clearly portrays purpose.

	<ul style="list-style-type: none"> • Simple, adult-like illustrations that are familiar to viewers. • Illustrations convey key messages clearly and help readers grasp key ideas from illustrations alone. • Uses step-by-step examples that build comprehension and self-efficacy. • Uses explanatory captions with illustrations and graphics.
Layout & typography (6)	<ul style="list-style-type: none"> • Uses at least 5 of the factors listed below. • Uses type that is in upper and lower case and is serif and is at least 12-point font, uses bold, size, colour to emphasise key points, does not use ALL CAPS. • Groups lists together under descriptive headings.
Learning stimulation (6)	<ul style="list-style-type: none"> • Presents problems or questions for readers response. • Models specific behaviour. • Divides complex topics into small parts to allow for small successes in understanding.
Cultural appropriateness (2)	<ul style="list-style-type: none"> • Concepts and ideas are culturally similar to logic, language, and experience of target audience.

Note. The numbers in brackets in the first column refer to the maximum number of points that can be obtained for that category.

Table 2. *Layout criteria required for a 'superior' rating on the SAM*

Layout factors
<ul style="list-style-type: none">• Illustrations are on same page beside related text.• Layout and sequence of information are consistent.• Visual cueing devices (shading, boxes, arrows) are used.• Adequate white space is used to reduce appearance of clutter.• Use of colour supports message and does not distract.• Line length is 30-50 characters.• High contrast between type and paper.• Paper has no gloss or low-gloss surface.

2.4.2 *Study Aim 2*

Recall of information was assessed through an interview (Appendix 2) containing seven questions about information provided during the initial tinnitus appointment. This was administered directly following participants' initial tinnitus appointment and approximately one to two weeks later. The clinician provided a scoring rubric with personalized answers for each participant depending on what was covered during the initial tinnitus appointment. It was not possible to ensure all appointments and answers were identical, as participants were all different, with various causes of tinnitus and difficulties which resulted in them presenting to clinic. The clinician did however keep appointments as similar as possible, using the same slide show as a visual aid.

Participants' recall ability were scored based on how many correct answers (out of the list of possible answers supplied by the clinician) they provided per question, with each question having a bottom score of 0 and a top score of 1. Questions had various numbers of correct answers, therefore if a participant correctly recalled 1 of 1 possible answers, they scored 1 point for that question. If they recalled 1 out of 2 possible answers correctly, they scored 0.5 points for that question. If they recalled 1 out of 3 possible answers correctly, they scored 0.33 and so on. This was completed for all questions and a final score out of 5 was derived per interview (as questions 6 and 7 were qualitative). Participants did not always answer the recall questions in the order they were asked. Therefore, an accurate answer, even if given during the response to a different question, was always marked as correct.

The first question inquired about the cause of tinnitus, and the second and third related to lifestyle factors that can make tinnitus better or worse. Next, the researcher asked about available treatments for tinnitus followed by management strategies that can help if tinnitus is affecting sleep, concentration, or communication. Participants were only asked about the management strategies that were relevant to them and discussed during their appointment. Finally, the last two qualitative questions inquired about what participants thought they had learned from the appointment and how they felt about their tinnitus after their appointment.

The audiologist conducting the tinnitus appointment also conducted an audiological evaluation for each participant. Two variables were obtained from that evaluation. The severity of the better ear variable was determined by calculating a 3-frequency (.5, 1, and 2 kHz) pure tone average of the better hearing ear (BEPTA). The

severity of the worse ear variable was determined by calculating a 3-frequency (.5, 1, and 2 kHz) pure tone average of the worse hearing ear (WEPTA).

The information questionnaire (Appendix 1) contains 16 items. Participants reported their age, gender, income, and level of education. In addition, participants were asked about their hearing and hearing aid experience. Participants provided information about whether they had previously used hearing aids, when they started using them, hours of use, and satisfaction with them. Participants also provided information about their tinnitus. Specifically, they reported information about the onset of their tinnitus, the severity of their tinnitus, how much it bothered them, the location of the tinnitus, and the aetiology of their tinnitus. Participants reported on previous tinnitus treatment and any familial history of tinnitus.

The TRQ (Wilson et al., 1991) was used to obtain a tinnitus reaction score for each participant prior to the initial tinnitus assessment. The TRQ evaluates the impact tinnitus is having on the respondents' quality of life by requiring them to rate on a scale of zero to four how much each item applies to them. The total score is derived by summing the total number of points from all 26 items. This study will use total TRQ scores as a variable measuring tinnitus-related distress. The highest possible score is 104, the higher the score the greater the level of reaction related to tinnitus.

2.5 Statistical Analyses

2.5.1 Study Aim 1

Descriptive statistics and frequencies were used to assess the readability of the original and revised brochures. The reading grade levels of both versions of the brochure by all 3 US grade level measures were compared to the recommended grade

level (5th – 6th US grade level). In addition, the reading grade levels between the original and revised versions of Brochure 1 were described for each readability measure.

The kappa generated from intraclass (ICC) correlations were used to assess inter-rater reliability for the SAM. For each brochure, the individual items were used as the unit of analysis (i.e., a single measures correlation). The kappa from the ICC for Brochure 1 was .944, with a 95% confidence interval between .864 and .977. The kappa from the ICC for Brochure 2 was .898, with a 95% confidence interval between .761 and .958. According to Fleiss & Cohen (1973), the kappa generated from an ICC is used to appraise the reliability of inter-rater agreement. It is “the proportion of agreement corrected for chance...” (p. 613). Fleiss (1981) stated “for most purposes, values greater than .75 or so may be taken to represent excellent agreement beyond chance...and values between .40 and .75 may be taken to represent fair to good agreement beyond chance” (p. 218). Thus, the inter-rater reliability for the SAM for both brochures was considered to be adequate. Therefore, the ratings displayed (Table 7) are for rater 1 only.

2.5.2 *Study Aim 2*

Descriptive statistics and frequencies were used to describe the participant sample. A two-tailed Wilcoxon was used to test the first set of study hypotheses regarding participant recall. Cohen’s d values were used to describe effect size (clinical importance) following the Wilcoxon. Part correlations were used to assess the amount of variance in recall that can be explained by patient variables. The coefficient of determination (R^2) was used to describe the effect size (clinical importance) following the part correlation.

Qualitative analysis was used to identify themes in participant answers for Question 6 (Salient points) and Question 7 (Feel about tinnitus) for the first and second interviews. Once themes were established from Question 6 and 7, the entire set of transcripts for all sixteen interviews were checked for meaningful coding units related to the established themes.

Two researchers independently analysed the participant transcripts to first identify meaningful coding units. These are the smallest set of words that encompass one idea (Table 3). The researchers were 1) a research audiologist with 17 years of clinical experience in adult rehabilitation and 2) a 2nd year Master of Audiology student with a Bachelor of Speech and Language Pathology (Hons).

Following the identification of meaningful coding units, commonalities between participants' meaningful coding units were categorized into general themes. The total number of times these were identified in the first and second interviews was summed to determine the most prevalent themes. The inclusion criteria for themes required at least two different participants to contribute meaningful coding units (across one set of interviews only).

Table 3. *Examples of categorization of meaning units into themes*

Meaning unit	Theme
<p>P1I1: 'I needed hearing aids'</p> <p>P2I1: 'I didn't think I would need hearing aids'</p> <p>P3I1: 'needing hearing aids'</p>	Need hearing aids (HA)
<p>P2I1: 'I can't afford it'</p> <p>P8I2: 'I mean it is a money issue thing at the moment.'</p> <p>P5I2: 'treatment is so expensive'</p>	Cost
<p>P8I1: 'it's really good to, actually know more about it.'</p> <p>P7I1: 'I can take away is what the actual results mean and what's actually going on inside of the, yeah.'</p> <p>P6I1: 'I have a better understanding of what's causing it.'</p>	Understanding

2.6 Ethical Considerations

Ethical approval was granted by the University of Canterbury Human Ethics Committee on 28 April 2014, as seen in Appendix 5. All procedures conducted during this study were in accordance with this approval. Informed consent forms and release of information sheets were signed by all participants.

Chapter 3

3.1 Overview

The two key topics that arose from the literature were evaluating and improving patient education material and recall of information from a tinnitus counselling session. The first aim of this study was to examine the readability and suitability of two tinnitus patient education brochures provided by the clinic to new tinnitus patients. The readability level of Brochure 1 and Brochure 2 was examined and it was found that both exceeded the internationally recommended 5th to 6th grade reading level (Weiss & Coyne, 1997) on the F-K, Fry, Fog, and SMOG. Brochure 1 was rewritten with the goal of improving readability to 5th to 6th grade reading level while maintaining the overall content and this was deemed successful. After administering the SAM it was found that Brochure 1 (38.09%) was unsuitable for patient education and Brochure 2 (47.62%) was adequate for patient education.

The second aim of this study was to investigate a) the amount of information tinnitus patients can successfully recall directly following their initial appointment, b) the amount of information that is retained one to two weeks following their appointment, c) whether the amount of information recalled is related to patient variables, and d) the themes that arose from interviews with the patients. Participants correctly recalled a mean total amount of 36.8% and 33.7% in the immediate and short-term respectively, and that the amount recalled correctly did not significantly differ between appointments. While none of the correlations performed for patient variables were statistically significant, there was a trend evident for demographic variables. There were, however, no noticeable trends when correlations were

performed for audiometric variables. Some of the most prevalent themes identified from the first set of participant interviews included Hearing aids, Understanding/Empowerment, and Masking/Music therapy. Prevalent themes from the second interview included Hearing aids, Cost, and Hope/Positive.

3.1 Sample Characteristics

Tables 4, 5 and 6 contain information regarding participant demographic, audiometric relating to tinnitus, and audiometric not relating to tinnitus, respectively.

Table 4. *Demographic patient variables*

Participant ID	Gender	Age (years)	School attendance (years)	Anxiety (TRQ score)
1	Female	75	8	12
2	Female	84	11	60
3	Male	48	11	40
4	Male	53	11	52
5	Male	31	13	95
6	Male	56	12	85
7	Male	39	11	74
8	Female	54	11	21
Mean	N/A	55	11	54.87
Range	N/A	31,84	8,13	12, 95

Note. Anxiety refers to the participants' score on the Tinnitus Reaction Questionnaire (TRQ), where 0 is no handicap and 104 is the maximum handicap possible.

Table 5. Audiometric patient variables specific to tinnitus

Participant ID	Tinnitus description	Tinnitus origin	Duration of tinnitus (years)	Onset of tinnitus	Self-rated tinnitus loudness (1-10)	Self-rated tinnitus annoyance (1-10)
1	High-pitch cicadas	Both ears	10	Very quickly	4	4.25
2	Mid-pitch buzz	Both ears	0.5	Somewhat slow	4	3.5
3	Mid-high pitch ring	Both ears	7	Somewhat slow	5.5	5.5
4	High-pitch scream	Both ears	10	Somewhat slow	7.5	8
5	Ring (R), hum (L)	Head	14	Very quick	7.5	10
6	Cicadas, mid-high pitch ring	Head	7	Very quick	5	7
7	High-pitch tone	Both ears	1.5	Very quick	8.5	8
8	High-pitch	Both ears	9	Very slow	6.5	6

	ring					
Mean	N/A	N/A	7.37	N/A	6.06	6.53
Range	N/A	N/A	0.5, 14	N/A	4, 8.5	3.5, 10

Table 6. Audiometric patient variables not specific to tinnitus

Participant ID	Hearing impairment	PTA better ear (dB HL)	PTA worse ear (dB HL)
1	No	28.33 (R)	28.33 (L)
2	No	13.33 (R)	16.67(L)
3	No	20(R)	31.67(L)
4	Yes	31.67(R)	33.33(L)
5	No	-1.67 (L)	3.33 (R)
6	No	3 (L)	5 (R)
7	No	3.33 (L)	6.67 (R)
8	No	23.33 (R)	30 (L)
Mean	N/A	15.16	19.37
Range	N/A	-1.67, 31.67	3.33, 33.33

Note. (R) and (L) refer to the right and left ears, respectively. PTA refers to pure-tone average. A lower PTA represents better hearing, and a higher PTA indicates greater hearing impairment.

3.2 Readability and suitability

3.2.1 Readability

The readability levels of Brochure 1 and Brochure 2 were examined and it was found that both exceeded the internationally recommended 5th to 6th grade reading level (Weiss & Coyne, 1997) on all readability measures used, as shown by Table 7 and Figure 3. A thorough comparison of readability features of Brochure 1 and the revised version are provided in Table 8. Brochure 1 was rewritten with the aim of improving readability to 5th to 6th grade reading level while keeping the overall content similar. It was found that Revised Brochure 1 was within the recommended readability limits for three out of four readability measures, as displayed in Figure 3. After examination of Brochure 1 and Revised Brochure 1 by an audiologist experienced in the field of tinnitus, it was concluded that the revised version of Brochure 1 successfully maintained the same overall content. The readability formulas used to analyse the documents were the Flesch-Kincaid reading grade level (F-K), the Flesch Reading Ease score (FRE), the Fry reading grade level, the Gunning Fog reading grade level (Fog), and the Simple Measure of Gobbledygook (SMOG). Four out of five of the measures estimate the US grade level needed to effectively read and understand documents, while the FRE score ranges between 0 and 100, with higher scores indicating better readability.

Table 7. *Readability analysis of original and revised patient education brochures*

Brochure ID	F-K	FRE	Fry	Fog	SMOG	Mean
Brochure 1	9	57	11	9.8	12	10.5
Brochure 2	9.6	57	10	12	12.3	11
Revised Brochure 1	5.3	80	6	6	8	6.3

Note. F-K = Flesch-Kincaid, FOG = Gunning's Fog Index Readability Formula,
SMOG = Simple Measure of Gobbledygook.

Table 8. *Comparison of readability features of original and revised Brochure 1*

Feature	Original	Revised
Number of sentences	36	43
Percent of “difficult” sentences (> 22 words)	13.9%	0
Longest sentence	27 words	20 words
Average sentence length	13.6 words	11.6 words
Number of words	488	500
Number of syllables	786	682
Percent of “difficult” words (> 2 syllables)	17.2	5.8
Percent of long words (> 6 characters)	36.3%	30.2
Percent of passive sentences	5.5	0

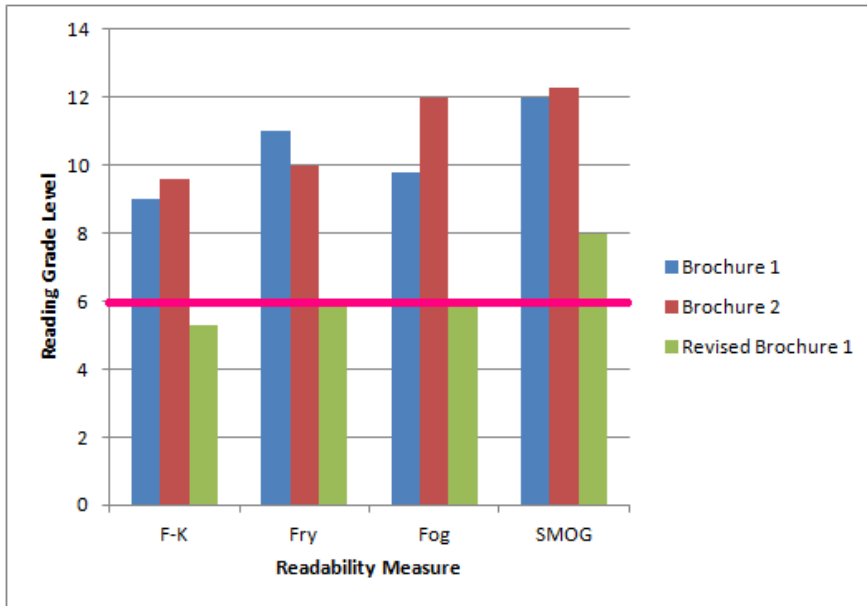


Figure 3. *Readability analysis of original and revised patient education brochures*

Note. F-K = Flesch-Kincaid, FOG = Gunning’s Fog Index Readability Formula (FOG), SMOG = Simple Measure of Gobbledygook (SMOG). The pink line illustrates the internationally recommended reading grade level (Weiss & Coyne, 1997) for documents intended for general consumption.

3.2.2 Suitability

Two experienced research audiologists independently rated Brochure 1 and Brochure 2 using the Suitability of Assessment Materials (SAM). Kappa from the ICC for Brochure 1 and 2 were .944 and .898 respectively. This indicated excellent inter-rater reliability (Fleiss & Cohen, 1973). Scores from 0 - 39% are deemed not suitable for patient education. Scores between 40 - 69% are judged as adequate, and scores over 70% are considered superior. The overall scores were 38.09% and 47.62% for Brochure 1 and 2, respectively. This indicates that Brochure 1 is unsuitable for patient education, and Brochure 2 is adequate for patient education material.

Table 9. *Suitability of Materials (SAM) for Brochure 1 and Brochure 2*

Areas assessed	Brochure 1	Brochure 2
Content (8)	5	4
Literacy demand (8)	5	5
Graphics (10)	3	4
Layout & typography (6)	2	4
Learning stimulation (6)	0	2
Cultural appropriateness (2)	1	1
Percent score	38.09%	47.62%

Note. The total points possible in each area is shown in brackets.

3.3 Patient recall

3.3.1 Immediate and short-term patient recall

It is apparent that participants recalled only modest amounts of information provided by their audiologist regarding their tinnitus appointment at both the first (immediate) and second (short-term) interviews (Table 10). The mean total amount of information recalled for the first and second interviews were 36.8% (Median = 38.6%, SD = 16.1%) and 33.7% (Median= 34.8%, SD= 15.4%) respectively. For Question 1(Cause of tinnitus), participants on average scored nearer half correct at 64.6% and 54.1% at their first and second interviews, respectively. The mean scores for the first and second interview for Question 2 (Make tinnitus better) were low, at 20.0% and

18.4%, respectively. The mean scores for Question 3 (Makes tinnitus worse) were also low, at 20.0% for both interviews. For Question 4 (Treatment available) the average scores for the first and second interviews were somewhat higher at 64.5% and 52.1%, respectively. Finally, Question 5 (Improve specific issues) yielded low means, at 15.0% and 24.1% for the first and second interview, respectively. More detailed information regarding percentage correct for individual participants and individual questions is available in Table 10 below.

Table 10. Amount of information correctly recalled by participants at first and second interview

ID	Cause1	Cause2	Better1	Better2	Worse1	Worse2	Treatment1	Treatment2	Issue1	Issue2	Total1	Total2
1	100	0	37	12	12	12	100	0	0	33	49.8	11.5
2	0	0	0	0	0	0	100	100	0	0	20	20
3	1	1	37	25	12	25	100	100	20	20	53.8	54
4	0	50	25	12	12	12	33	0	0	40	14	22.8
5	67	33	12	12	37	37	0	0	33	67	29.8	29.8
6	1	1	12	37	25	25	100	100	0	0	47.4	52.4
7	1	1	25	12	25	37	50	50	67	0	53.4	39.8
8	50	50	12	37	37	12	33	67	0	33	26.4	39.8
<i>Mdn</i>	83.5	50	18.5	12.0	18.5	18.5	75.0	58.5	0	26.5	38.6	34.8
<i>Mean</i>	64.6	54.1	20.0	18.4	20.0	20.0	64.5	52.1	15.0	24.1	36.8	33.7
<i>SD</i>	44	42.5	13.2	13.3	13.2	13.2	40.3	46.7	24.4	33.9	16.1	15.4

Note. Percent correct, medians (Mdn), means and standard deviations (SD) on the recall items Question 1 through 5 and total scores for the first (immediate) and second (short-term) interviews. Questions 6 and 7 cannot be scored as these were opinion-based and are described thematically.

3.3.2 Relationship between amount of information recalled and demographic variables

Firstly, correlations were performed on the demographic variables and the total recall scores for the initial and short-term follow up interviews (Table 11). All correlations were non-significant therefore they may have occurred due to chance, however the accompanying effect sizes were calculated. While these correlations were non-significant if they were found to be repeatable they may have been due to a true relationship between the variables.

The variance in age only explains a small amount (3.6%) of the variance in immediate recall, however a larger amount of the variance (25%) is explained in short-term recall. This trend is consistent for education as while only a small amount of variance (7.3%) is explained in immediate recall, this increases to 26% for short-term recall.

Table 11. *Pearson correlation for demographic variables*

	Immediate Recall	Short-term Recall
Age	$r = -.192, p = .65, r^2 = .036$	$r = .509, p = .198, r^2 = .25$
Education	$r = -.267, p = .52, r^2 = .073$	$r = .511, p = .196, r^2 = .26$

3.3.3 Relationship between amount of information recalled and audiometric variables

Next, partial correlations were performed on the audiometric variables and the recall scores for the initial and short-term follow up interviews controlling for the effects of the demographic variables: age and education. Once again, no correlations

were statistically significant therefore effect sizes were also included. This statistical non-significance means that there is a chance that instead of a true relationship, the correlations could be due to chance.

For these audiometric variables, no trend could be identified therefore this indicates that there may be no relationship between the variables and participant recall. As previously stated, these results are not statistically significant therefore further data would be required to check for repeatability.

Table 12. *Partial correlation for audiometric variables*

	Immediate Recall	Short-term Recall
TRQ	$r_p = .376, p = .46, r^2 = .14$	$r_p = -.257, p = .62, r^2 = .06$
Loudness	$r_p = -.654, p = .16, r^2 = .43$	$r_p = -.455, p = .36, r^2 = .20$
Annoyance	$r_p = -.506, p = .30, r^2 = .25$	$r_p = -.720, p = .11, r^2 = .52$
BEPTA	$r_p = -.707, p = .11, r^2 = .49$	$r_p = -.048, p = .93, r^2 = .002$
WEPTA	$r_p = -.626, p = .28, r^2 = .39$	$r_p = .116, p = .83, r^2 = .01$

Note. BEPTA = better-hearing ear pure-tone average, WEPTA = worse-hearing ear pure-tone average.

Whether participants had worn hearing aids previously was also going to be used as a dependent variable, however as only one participant wore hearing aids this could not be analysed.

3.3.4 Amount of information recalled immediately compared to in the short-term

A two-tailed Wilcoxon signed ranks test revealed no significant change in immediate and short-term (one to two weeks later) recall scores (Table 13). None were statistically significant as $p = 0.05$. As shown above (Table 10), the mean total amount of information recalled for both interviews was well below 50% correct. The mean total amount of information recalled by participants for the first and second interviews was 36.8% and 33.7%, respectively. Effect sizes were also calculated, however all fell well below the *a priori* defined clinically significant effect size of $d = 1.0$.

Table 13. *Change in amount recalled correctly between first and second interview*

Question ID	Z	p	d
1. Cause of tinnitus	Z = .535	p = .750	0.24
2. Makes tinnitus better	Z = .106	p = .094.	0.12
3. Makes tinnitus worse	Z = .00	p > .99.	0
4. Available treatment	Z = .535	p = .593.	.28
5. Improve specific issues	Z = .677	p = .498.	.30
Total	Z = .105	p = .917.	.19

Note. Z associated with the Wilcoxon test, p value, and effect sizes (Cohen's d) are displayed above. Questions 6 and 7 are opinion-based questions with no correct answer to be scored therefore are not included.

3.3.5 Themes identified at first interview

The following themes in order of prevalence were identified for the first interview. Each will be supplemented by relevant participant quotes (Table 14).

Table 14. *Themes identified from participant meaning units from the first set of interviews*

Theme	Number of participants
Hearing aids	7
Understanding/Empowerment	5
Masking/Music therapy	4
Hope/Positive	4
Cost	2
Unaware	2
Anxious	2

Theme 1: Hearing aids

Nearly all participants (seven out of eight) were aware of hearing aids as a treatment for tinnitus, or recalled that this was a treatment recommended for them in particular following their first appointment with their audiologist. Participant 2 said: "I didn't think I would need hearing aids".

Theme 2: Understanding/Empowerment

Encouragingly, the majority of participants (five out of eight) felt that they had a better understanding of the condition following their initial appointment. Participant 6 explained: "I've got a more intricate understanding of what causes tinnitus," followed by a later comment in the interview, "the more one knows and understands about the problem the easier it is to embrace and live with." Similarly, Participant 3 stated: "I think... awareness. Understanding the medical condition," in response to being asked what the main thing learned was at the appointment.

Theme 3: Masking/Music therapy

Apart from remembering that hearing aids were an available treatment for tinnitus, four of the participants also mentioned soothing or soft music, or a masking device. For example, Participant 3 answered "soft music in the background" as a way to make tinnitus better.

Theme 4: Hope/Positive

Encouragingly, four of the participants expressed hope or positive feelings regarding moving forward with their tinnitus following their first appointment. Participant 7 said that he is "hopefully more confident about going forward... a light at the end of the tunnel," and Participant 4 expressed: "the positiveness that we can... mask the tinnitus."

Theme 5: Cost

Two participants expressed concerns over the cost of treatment for tinnitus, for example Participant 5 said: "to fix it [tinnitus] is going to be really expensive."

Theme 6: Unaware

Interestingly, two participants were surprised about how "bad" things were. Participant 2 explained that she "didn't know it was as bad as what it was" and Participant 8 learned "how bad it was". However, it is unclear whether these participants are referring to the diagnosis of hearing loss or their tinnitus.

Theme 7: Anxious

Two participants also expressed concerns over potential treatment effectiveness. Participant 5 was worried that the treatment "might or it might not work".

Table 15. *Themes identified from participant meaning units from the second interview*

Theme	Number of participants
Hearing aids	6
Cost	5
Hope/Positive	4
Music therapy	3
Annoyed/Frustrated	3
Understanding/Empowerment	2

3.3.6 Themes identified at second interview

The themes identified for the second interview are displayed below with relevant participant quotes (Table 15). The themes are in order of prevalence.

Theme 1: Hearing aids

Analogous to directly after the first appointment, six out of the eight participants mentioned that hearing aids were a treatment for tinnitus at their one- to two-week follow up. Participant 8 answered: "the treatment was the hearing aids", and Participant 6 said that "the only thing I'm aware of are the hearing aids".

Theme 2: Cost

The number of participants who expressed concern over the cost of treatment increased to five out of eight at the one- to two-week follow up interview. Participant 5 said that "treatment is so expensive", while another (Participant 8) explained that "it is a money issue thing at the moment."

Theme 3: Hope/Positive

Four of the participants expressed positive feelings or were hopeful at one to two weeks follow up. Participant 4 noted that "any improvement is going to be great" and Participant 7 said that "hopefully there is a bit of light at the end of the tunnel."

Theme 4: Music therapy

At the one- to two-week follow up, three participants mentioned music as a treatment for tinnitus. For example, Participant 1 mentioned that "soft music" could help tinnitus and Participant 8 explained that one treatment "was like an iPod playing music."

Theme 5: Annoyed/Frustrated (regarding tinnitus)

Three participants expressed that they found their tinnitus frustrating or annoying, for example Participant 6 said that "it's [tinnitus] a very annoying thing to say the least", and Participant 3 explained that "it [tinnitus] is still frustrating."

Theme 6: Understanding/Empowerment

At one- to two-weeks follow up, two participants discussed that that due to their better understanding of tinnitus, their acceptance of the chronic condition had also increased. Participant 6 explained: "I feel that I have an incremental increase in acceptance of it, because to understand it more fully is to accept it more fully."

Chapter 4

4.1 Aims

The two main areas that were identified after reviewing the literature were: examining and improving patient education material and recall of information from a tinnitus counselling appointment.

The first aim was to evaluate the suitability and readability of two tinnitus patient education brochures provided to new clients by a private practice audiology clinic. If the readability measures deemed the brochures to be higher than 5th to 6th grade reading level (Weiss & Coyne, 1997) then Brochure 1 would be rewritten with the goal of reducing the reading grade level while maintaining similar overall content.

The second aim was to examine investigate a) the amount of information tinnitus patients' can correctly recall immediately after their initial appointment, b) the amount of information that is preserved one to two weeks following their appointment (short-term), c) whether there is a relationship between the amount of information recalled and demographic or audiometric participant variables, and finally, d) the themes that arose from interviews with the patients.

4.2 Key findings

After analyzing the readability of Brochure 1 and Brochure 2 it was found that both exceeded the recommended 5th to 6th grade reading level (Weiss & Coyne, 1997) on the F-K, Fry, Fog, and SMOG. Consequently, Brochure 1 was revised with the goal of reducing the reading grade level to within the international recommendations while keeping the content similar to the original. After assessment by an individual

with 37 years of clinical audiology experience working with adults suffering from tinnitus, it was concluded that the revised brochure succeeded in at maintaining the same content as the original.

The SAM was administered to assess the suitability of patient education brochures for tinnitus patients. It was found that Brochure 1 was unsuitable for patient education and Brochure 2 was adequate for patient education.

Overall, participants recalled only a small amount of information in the immediate (36.8%) and in the short-term (33.7%). This did not vary significantly between appointments, and none of the correlations performed for recall and participant variables were statistically significant. This means that any relationships observed between the variables may be due to chance, and indeed for audiometric variables no trend was found. Demographic variables age and education did however tend to explain more of the variance in recall in the short-term than immediately. If this relationship was found to be repeatable it may be a true relationship as opposed to chance.

The most notable themes identified in the interview immediately after the appointment were: Hearing aids, Understanding/Empowerment, and Masking/Music therapy. At the short-term follow up Hearing aids was still a prevalent theme, however Cost and Hope/Positive were also commonly reported.

4.3 Readability

Readability of print material takes into account the ease with which the material is read and is also affected by design features such as: spacing and size of font, visual appeal, personalization, organization, and colours used (Eames et al.,

2003). There are a number of readability formulas used to predict the reading grade level required to effectively read print material (Mumford, 1997). These look at aspects such as average sentence length, number of syllables per word, number of words that are commonly used (Sullivan & O’Conor, 2001), number of personal pronouns, number of personal sentences (DuBay, 2004).

While not within the scope of this study, it would have been very useful to have feedback from the intended population who will use the brochures, namely individuals who suffer from tinnitus. A short interview can be conducted to help verify the suitability of patient education material and shed light on any communication, design, or content issues. This process is called learner verification and revision (Doak et al., 1996).

Learner verification and revision allows gaps and mismatches in patient material to be uncovered, as these can lead to disbelief, failure to accept the information, or misunderstandings. This process identifies specifically what patients understand, preferably while in draft form and easily adaptable. However, if the material has already been written supplementary information can always be added.

The specific elements examined are: attraction, comprehension, self-efficacy, cultural acceptability, and persuasion. Attraction refers how well the resource appeals to the intended audience, because if the patient does not take the time to read the material a learning opportunity has been lost. How well a patient comprehends information is crucial, especially for those with poor literacy skills. This element investigates how the patient has interpreted the information provided. Self-efficacy examines whether patients feel they will realistically be able to carry out the instructions or adhere to the information provided and whether more information is

needed. Cultural acceptability can check for mismatches between the patient and the resource. Hairstyles, clothing, or cultural messages that do not match the reader may negatively impact cultural acceptance. Persuasion refers to how well the resource encourages readers to carry out the instructions or adhere to the advice contained (Doak et al., 1996). The steps to carrying out learner verification and revision are: preparation (prepare questions, train interviewers, and plan the sample and test sites), interviewing patients, and evaluating responses with revision (Doak et al., 1996).

As noted above, after administering the F-K, Fry, FOG, and SMOG to the brochures handed out to new tinnitus clients at a clinic, it is apparent that they are above the internationally recommended 5th to 6th grade reading level (Weiss & Coyne, 1997). This is consistent with what has already been described in the literature, that patient education resources in healthcare exceed the recommended levels to allow patient comprehension of the information presented.

Audiology is only one of a number of healthcare disciplines that utilise readability formulas to evaluate patient education material (Laplante-Levesque et al., 2012). The mean reading grade level for Brochure 1 and 2 were 10.5 and 11, respectively, which is consistent with the literature that reports the bulk of audiology (Atcherson et al., 2014; Atcherson et al., 2013; Atcherson et al., 2011; Laplante-Levesque et al., 2012), speech therapy, and otolaryngology documents are above the internationally recommended 5th to 6th grade reading level. Research into readability of verbal dialogue between audiologists and their clients found that patients' predicted health literacy scores were under 3rd grade reading level with the clinicians' level of language differing significantly (Nair & Cienkowski, 2010). So, as well as a gap between the level of difficulty of patient education information, this study (Nair &

Cienkowski, 2010) suggests that there is also a comprehension gap between clinicians and their patients during appointments.

In summary, the vast majority of healthcare patient education material that has been analyzed is above the recommended readability levels. This is an issue because for readers with poor health literacy skills and even those with adequate skills, lower grade reading levels are preferred (Weiss & Coyne, 1997). Patient material that is at an appropriate reading level for their target audience will improve said audiences' ability to read the information and their motivation to persevere with the material. Conversely, health material that is too difficult for the intended audience may remain inaccessible (McInnes & Haglund, 2011), meaning that they will not benefit from the information they have been given. Consequently, patients that are unable to access health information may not take an active role in their healthcare or fail to access healthcare at all (Atcherson et al., 2014). There is a real need to consider the readability of patient education resources provided to patients, whether it is an article available on the Internet or a leaflet provided in a clinic. Only if the difficulty of the resource is within the individual's abilities will they be able to comprehend and benefit from the health information it contains.

There are, however, limitations to using these formulas to determine the readability of patient print material. For one, everyone is different. The formulas do not take into account between-reader differences (Redish, 2000) such as age or maturity of the reader, presence of a communication disorder, whether the resource is in the reader's native language, relevance to the reader, or previous experience with the information. So while readability formulas are based on correlations with a measure of comprehension and aim to predict the reading level required to understand

a piece of print material, they do not explain the causes of problems individuals may have in reading the material.

Readability formulas are not perfect, and the resulting grade level can be impacted by what selection of text is chosen from the material (Redish, 2000). They also cannot evaluate content, word order, format, imagery, or organization of the document (Klare, as cited in Redish, 2000). They also fail to examine print size and type, which may influence how an individual can read the material. The contrast of colour between the ink and paper may be better for some documents than others and this is also unable to be determined via readability formulas. This is why it is very useful to not only look at readability of patient education material, but to also evaluate its suitability.

For tinnitus patients in particular, patient education material with a high RGL means that the important information contained will be accessible only to patients with excellent literacy skills. Even then, simpler and easier to read text is preferred by all readers (Weiss & Coyne, 1997). Reading level is critical to patient comprehension. If the tinnitus information is not easily understandable then patients will not benefit from their intended resources. This could mean missing out on information about what tinnitus is, the potential causes, lifestyle factors that can help or hinder those with tinnitus, potential treatments, and how they should go about accessing services. Not being able to access this information could result in increased anxiety and the negative emotions that can be associated with tinnitus (Langguth, 2011; Møller et al., 2010). Patients may be unsure of how to access health services that can help them manage their tinnitus, or even that such services exist.

This study has demonstrated that a brochure with predicted reading grade levels of 9 to 12 can be rewritten to between 5.3 and 8 while maintaining similar overall content. The revision process was relatively simple and involved shortening sentences and reducing multi-syllabic or uncommon words. Studies in the future need to actively revise patient resources to lower reading grade levels, instead of only measuring readability and deeming it to be excessively high.

Some other studies which have revised patient material are Davis et al. (1996), Pothier, Day, Harris, and Pothier (2008), Sakai (2013). Davis et al. (1996) wanted to investigate whether a short and simple pamphlet with a low reading grade level would be preferred by parents to the currently available Centers for Disease Control and Prevention polio vaccine information resource. The original resource was 16 pages long, approximately 18000 words, 10th grade reading level, and contained no graphics. The revised resource was 4 pages long, approximately 300 words, 6th grade reading level, and had 7 graphics. Attitude to the text, comprehension, and time to read the resources were recorded for 522 parents. 56% of parents comprehended the original resource effectively, which increased to 72% for the revised resource ($p < 0.001$). Time taken to read the resources was nearly 14 minutes for the original text, dropping to around 4 minutes for the revised text. These patterns were not significant for adults reading at a 3rd grade reading level or less. This is not surprising considering the revised resource was higher than this, at the internationally recommended 6th grade reading level. It was concluded that parents preferred a shorter and more simple resource, although the readability was decreased to the recommended levels this will still be too difficult for some parents with low literacy skills.

The aim of Pothier et al. (2008) was to revise the current available departmental Speech and Language Therapy brochures with the National Health Service Toolkit for Producing Patient Information and examine the readability levels for the original and revised material. The F-K and FRE revealed significantly improved readability scores for the revised material. While just 25% of the original brochures met the recommended readability standards, a much larger proportion (75%) of the revised material met the advised levels. The scores were less variable for the revised material as well.

Lastly, Sakai (2013) explored how to best evaluate and improve Japanese health information material in regards to readability and comprehension. A medical professional wrote some educational material on chronic suppurative otitis media for a website meant for patients. This was made into six different texts with four revised either in syntax, text structure, or readability only. Two were revised using improvements in all three factors. Improving vocabulary involved paraphrasing with specific words, using less jargon, and more examples and metaphors. Improving text structure involved giving context before new information, utilizing topic sentences, having paragraphs represent one concept, and linking pronoun references, replacements or substitutions of words to ideas. Improving syntax involved simplifying sentences and changing passive to active voice. The texts were evaluated by 270 high school students via an online survey. True or false style comprehension tests revealed that better text structure significantly improved comprehension. It was also found that using common vocabulary resulted in higher comprehension scores using a cloze test.

Overall, all studies found that simplifying and improving the readability levels of patient education material is achievable (Pothier et al., 2008). The present study also demonstrated that it is feasible to improve readability levels of a patient education tinnitus resource. Unfortunately, it was only within the scope of this study to revise the brochure to appropriate readability levels, and not also carry out learner verification with the intended readers. It was also demonstrated in previous studies that comprehension and understanding can be improved when patient materials are revised to more simple versions with better readability levels (T. C. Davis et al., 1996; Sakai, 2013).

Some online resources which can be accessed for help in developing and improving education material for the general public are <http://www.plainlanguage.gov/whatisPL/index.cfm>, <http://www.healthliteracy.com/>, and the Patient and Family Education Material Guidelines (available from <http://www.cdha.nshealth.ca/>).

The Plain Language website (The Plain Language Action and Information Network) aims to improve communication from the United States federal government to the general public. Plain language is defined as communication which the viewers or readers will be able to comprehend effectively upon first seeing, reading, or hearing it. It is suggested that written patient education material uses plain language if the intended audience is: able to locate what is needed, comprehend what has been located, and effectively use what has been located to meet their needs. Techniques which can be utilized to carry out these aims are: personal pronouns, common vocabulary, easy to read design features, active rather than passive voice, and appropriate organization of content.

4.4 Suitability

Suitability measures how well readers will be able to understand and accept print material (Doak et al., 1996). The Suitability of Materials (SAM) instrument readily allows health care practitioners to systematically evaluate the suitability of their patient education material. The authors suggest a three-pronged approach using a) Assessment Checklist of Attributes, b) readability formulas, and c) SAM. The SAM was used to assess the brochures provided to tinnitus patients for this study. The specific areas SAM examines are: content, literacy demand, graphics, layout and typography, learning stimulation and motivation, as well as cultural appropriateness. Within each factor there are two to five points that are scored either 2 for a superior rating, 1 for an adequate rating, or 0 for a not suitable rating. N/A can be used if the factor does not apply to the material. The total score is added and converted into a percentage with 70 to 100% indicating superior material, 40 to 69% indicating adequate material, and 0 to 39% representing not suitable patient education material. It is also noted that deficiencies in cultural appropriateness or very high readability levels may deem the resource unsuitable overall. Brochure 1 and 2 were deemed “adequate” for cultural appropriateness at 50%, and literacy demand 62.5%.

Currently, there are very few studies using suitability assessment, although it is a valuable way to evaluate patient education material and consequently solve issues with said resources. Shieh and Hosei (2008) did however, use the SAM to investigate the suitability of 15 patient education materials covering topics such as food safety and breast feeding. Positively, on average the materials obtained adequate ratings (mean = 66.5%). Areas where materials scored more poorly were lack of summary, readability, and failing to pose questions for the reader.

More specific to audiology, Caposecco, Hickson, & Meyer (2014) used the SAM as part of their analysis of readability, content, and design of hearing aid brochures to investigate suitability for older adults. Four hearing aid brochures from nine manufacturers were evaluated and overall the resources obtained an adequate rating (mean = 52%). At first this seems relatively consistent with Sheih and Hosei (2008), however due to high readability levels twenty-five out of thirty-six guides were deemed unsuitable for patient education. Although Shieh and Hosei (2008) also found that an area where the patient education materials assessed in their study fell short was readability. This is consistent with the readability literature available, as many materials in healthcare are well above the suggested 5th to 6th grade reading level recommendation. However, this is still disconcerting as one of the things which Doak et al., (1996) wrote that may make a resource unable to be amended is very high readability levels. The current study only used a small sample size of brochures, one of which obtained an adequate rating, while the other an unsuitable rating. This is relatively consistent with the other two reported studies.

Two independent raters scored the original two tinnitus patient education brochures and found that Brochure 1 is unsuitable for patient education at 38.09%, and Brochure 2 is adequate for patient education at 47.62% (Table 9). For Brochure 1, three factors were deemed “not suitable”: Graphics (30%), Layout (33.33%), and Learning Stimulation (0%). For Brochure 2, one factor was deemed “not suitable”: Learning Stimulation (33.3%).

Caposecco et al., (2014) provided the number of brochures (out of 36) with a superior, adequate, and not suitable rating for all elements of the six main factors. Under content 10 were rated unsuitable for specific scope, and 12 were rated as

unsuitable as they did not include a summary. Similarly, the brochures analyzed in this study were critiqued for not having a review or summary section and additional information which may result in the reader missing the main points.

For the factor of literacy demand, 25 brochures were deemed unsuitable for the element reading grade level. No brochures achieved a superior grade, with the remaining 11 rated as adequate for reading grade level (Caposecco et al., 2014). This means that none of the brochures were under a 5th grade reading level, similar to the brochures in this study which were well above 6th grade reading level on the F-K, Fry, FOG, and SMOG formulas. It is critical for patient information to be easily readable, otherwise the information contained will not be accessible to a large proportion of the population. Caposecco et al., (2014) also found that for literacy demand, 16 brochures were rated as unsuitable for using an excessive number of uncommon words. Excessive uncommon word use may dramatically increasing the time it takes to read the resource or even result in the reader giving up on the text entirely. Uncommon words are likely to affect those with low literacy skills even more so than those with adequate literacy skills.

For graphics, Caposecco et al., (2014) 19 brochures were deemed unsuitable due to the cover graphic not relating to the content, and 35 out of 36 brochures did not caption their graphics resulting in an unsuitable grade for this element. The brochures from this study also lost marks in this area. For nearly all (35 out of 36) brochures in Caposecco et al., (2014) there was a lack of captioning, akin to comments on the brochures analyzed in this study. The graphics used were not linked to the text. Captions direct the reader to the focal points of the graphics. In Caposecco et al.,

(2014) only 3 brochures were rated as unsuitable for layout factors within layout and typography. Cultural appropriateness was not assessed.

For learning stimulation and motivation, Caposecco et al., (2014) found that none of the brochures interacted with the reader and 9 were deemed unsuitable for the motivation and self-efficacy element. Both brochures examined in the current study also received unsuitable ratings for reader interaction. Interaction refers to the text posing questions or problems for the reader to engage with (Doak et al., 1996) and therefore improve recall and long-term retention of the information.

Doak et al., (1996) discuss why the various factors of SAM are important and what makes a resource superior for the purposes of patient education (Table 1 and 2). Within the content factor, the points on which resources are rated are: a) purpose, b) content topics, c) scope, and d) summary and review. Purpose is important because if patients miss the intended use of the material then the main point may be missed. Content topics are significant as adult patients usually desire behavioural information about how to resolve their imminent health-related problem. Having a specific scope for the resource is important and only essential, directly related information should be included to allow patients to learn the necessary information in the time allowed. Including a summary at the end of the material allows readers the ability to read the most important points from the document, which may have been missed the first time around. Brochure 1 and 2 achieved an adequate rating for content with scores of 62.5% and 50% respectively. Critiques for the tinnitus brochures included the lack of a summary, not enough behaviour-based content, and too much extraneous information added. Not including a summary with a lot of additional information

present may mean readers miss the most important points of the brochures, therefore missing a learning opportunity and making the text less salient overall.

For literacy demand, the specific points to be rated are: a) reading grade level, b) writing style, c) vocabulary, d) in sentence construction, and e) learning enhancement by advance organizers. A low reading grade level is crucial to patient comprehension, and readability formulas can provide information on this as previously discussed. An active voice or conversational style of writing is important for creating easily understandable resources. Utilizing common vocabulary and not using general words, value judgements, and vague concepts can help making patient material easier to understand. Captions or "road signs" can be useful in preparing the reader for the next topic and making the resource look less intimidating to read. Brochure 1 and 2 received an adequate rating for this factor with a score of 62.5%. Critiques for literacy demand included passive voice use (instead of active voice), uncommon word usage, lack of road sign usage, and moving between first and second person. While both brochures were deemed adequate, the overall RGL for each was still over the internationally recommended levels which may negatively impact patients' ability to understand or persevere with the material, especially if they have lower literacy skills. People with poorer reading skills are likely to read one word at a time. Lengthy sentences and multi-syllabic uncommon words may result in them reading a whole sentence without knowing the meaning. Captions or road signs would have been useful to alert readers as to make the brochures seem less intimidating.

For the graphics factor, the points included are: a) cover graphic, b) type of illustrations, c) relevance of illustrations, d) graphics (charts, tables etc), and e) captions. The cover is the first thing readers will see, and it can influence their interest

and attitude towards the content. The kind of illustrations used should be familiar and concrete, such as simple line drawings, to promote realism and memory. The illustrations also must be relevant and "capture" the viewer by explaining key points visually. Also, it is necessary for the graphics that have been included to be explained by the author. Lastly, captions should be included as they direct the reader as to the focus and purpose of the graphic, and omitting them could prevent learning opportunities. For graphics, Brochure 1 was deemed unsuitable for patient education for graphics with a score of 30%. Brochure 2 barely achieved an adequate rating with a score of 40%. A critique for graphics was that cover graphics were either unrelated to the topic (Brochure 1) or not included (Brochure 2). A second comment was that graphics used did not link to the text or were not explained. An implication for the intended population is that if the cover graphic is not clearly related to the content the material may be overlooked entirely. If no cover graphic is used, the material may look more intimidating and once again patients may overlook the brochure. Unrelated or unexplained graphics in the brochures are less likely to contribute to patient understanding of the information presented. Pictures or other graphics need to aid in recall and understanding, not detract from the overall message. Short captions would also assist in making graphics relevant and link them to the text.

Within the layout factor, a) layout, b) typography, and c) subheadings are the relevant points. Layout of resources greatly affects how suitable text is for intended readers. Typography refers to font type and size, and can significantly affect how well patients can read material. For example, too many different kinds of fonts or using all capital letters can hinder the reading process. Finally, subheadings are important to include as adults are unlikely to keep over seven pieces of information in their short-term memory at one time. This number may fall to three to five for those with poor

literacy skills, hence the importance of "chunking" information into digestible parts. For this factor, Brochure 1 received an unsuitable for patient education rating with 33.3% where Brochure 2 was deemed adequate with a score of 66.7%. For layout, critiques included using small font, single spacing, a lack of white space, lack of visual cueing, and long line length. Brochure 1 could have benefited from "chunking" of information into shorter topic-focused sections as seeing blocks of text can be intimidating. Small font, single spacing, and other typography-based issues may discourage the reader, especially one that possesses low literacy skills.

The relevant points under learning stimulation and motivation are: a) interaction included in text and/or graphic, b) desired behaviour patterns are modelled, and c) motivation. Including some level of patient interaction with the material is important as this assists in long-term retention. This could be in the form of posing a question or choose between two options. Patients will likely benefit more from carrying out an action on their own or by observing the skill instead of being told. Therefore, desired behaviour patterns should be modelled such as specific food preparation tips for a nutrition patient resource. Unsurprisingly, motivation is a key aspect of suitability, because if a patient is not motivated to read the material then it is unlikely they will learn from it. Readers will feel more motivated if the solutions provided in the resource seem realistic for them. For learning stimulation, Brochure 1 and 2 were deemed unsuitable for patient education with scores of 0% and 33.3% respectively. Critiques for this factor were that no interaction with the reader was used, no behaviours were modelled or explained, and there was a lack of self-efficacy opportunities. If patients do not feel motivated to read the brochures they most likely will not and the information contained will not be accessed. Similarly, if the behaviours contained in the brochures do not seem realistic or achievable it is less

likely patients will take heed of the advice. The lack of interaction with the reader in the brochures may result in readers not engaging with the material and decreasing its' overall salience.

The sixth and final factor of the SAM is cultural appropriateness, and the relevant points are: a) cultural match: logic, language, experience (LLE) and b) cultural image and examples. Cultural match is measured by how effectively the LLE of the resource matches the intended audience. For example, giving nutritional advice to eat foods that are not normally consumed by the culture of the intended audience is not a match. The cultural images used in the resource need to be positive and realistic to promote acceptance. Both brochures obtained scores of 50% for cultural appropriateness, which achieved an adequate rating. The critiques for this factor included a lack in match of logic and language, and the use of similar terms instead of one word only. Cultural images was not assessed for this factor, although LLE match was. There is a mismatch here as while tinnitus prevalence increases with age (Kochkin et al., 2011; Weinstein, 2000), neither brochure was aimed toward older adults or included examples with older adults.

It was not within the scope of this study to redesign and rewrite the original brochures and for the same independent raters score the revised material, however this would be a valuable addition to any study investigating readability and suitability of healthcare patient education resources. Doak et al. (1996) state that even an "unsuitable" rating in even one of the 22 points making up the six overall factors is a significant deficiency. They suggest that these can be amended by adding supplementary material or revising drafts of patient resources.

A future direction for research in suitability would be to first and foremost, complete more of these studies in healthcare and particularly in audiology. So far the current study, and the two studies mentioned above have completed SAM analysis but not used it for the purpose of revising the problem areas to improve health care resources by making them more suitable for their intended audiences. Another valuable addition to future research would be to include learner verification and revision to assess both new patient material being created as well as patient educational material that is already available.

4.5 Recall

It is important to ensure that clinicians in all fields of healthcare are providing written and verbal information in a way that is readable, suitable, and able to be remembered effectively by the intended patients, especially for those with low health literacy. As medical research has found that patients forget a massive proportion of what health care professionals tell them immediately (Kessels, 2003), and half of what is remembered is incorrect (J. L. Anderson et al., 1979), it is crucial that information is presented in the most helpful and clearest way possible.

It is even more crucial to provide easily understandable information for those who do not possess adequate health literacy skills. For an individual to have adequate healthy literacy skills, it would mean they have sufficient intelligence and communication abilities to comprehend everyday health information and therefore the skills to make informed medical choices (Ferguson, 2013; Hester & Stevens-Ratchford, 2009). Patients with poor health literacy may feel embarrassed about not understanding (Parikh et al., 1996) and therefore not ask for clarification or hide their shortfalls (Kendig, 2006). The Ministry of Health in (2010) reported that 56.2% of

adults in New Zealand have low health literacy skills. This means that over half the population of New Zealand adults are at risk of not being able to effectively understand and remember oral healthcare information and therefore not coping in a health care setting.

Patient deficits in the areas of numeracy and reading have been studied in more detail than the ability to comprehend and recall oral health information (Roter, 2010). There are not many recall studies in audiology currently, although Watermeyer, Kanji, & Cohen (2012) investigated caregiver recall immediately following audiological assessment where four out of five participants recalled the final diagnosis and recommendations correctly. However, a large amount of information was still missed. Reese and Hnath-Chisolm (2005) and Reese and Smith (2006) examined how much information new hearing aid wearers successfully recalled immediately and in the short-term (1 month) following a hearing aid orientation appointment. Immediately after the appointment participants correctly recalled around 75 to 80% correctly, and in the short-term this remained fairly consistent. Reese and Smith (2006) do note that some important information was lost, namely memory function and feedback information.

Overall, the participants in this study recalled a modest amount of information correctly, with a mean of 36.8% immediately following their initial tinnitus appointment, and 33.7% after a period of one to two weeks. This is considerably lower than for Reese and Hnath-Chisolm (2005) and Reese and Smith (2006), however the trend of participants retaining the same amount of information at follow-up is similar. In general, participants answered questions relating to the cause of their tinnitus (mean 1st = 64.6%, mean 2nd = 54.1%) and treatments for tinnitus (mean 1st

= 64.5%, mean 2nd = 52.1%) well at both interviews. Participants answered more poorly for questions relating to things that make tinnitus worse (mean 1st= 20%, mean 2nd = 20%) things that make tinnitus better (mean 1st = 20%, mean 2nd = 18.4%), and strategies for helping specific issues (mean 1st = 15%, mean 2nd = 24.1%). A two-tailed Wilcoxon ranks test showed that there was no statistically significant change between the first and second interview. Effect sizes were also calculated, however all fell far below the a priori defined clinically significant effect size of $d = 1.0$.

It is also important to note that patients only recalled, not necessarily comprehended, around 30% of the material from their initial tinnitus appointment. This may mean that as well as simple tinnitus resources to read over at home, there should be some revision of the previously covered material at the follow up appointments. Patients may need more than one appointment to discuss their treatment options. This would expose patients to the tinnitus information more than once and facilitate better understanding. Another option would be to split the diagnostic appointment and the discussion of treatment options across two appointments to decrease the amount of information patients need to understand and retain at one time.

There are a number of potential reasons why these participants only achieved modest recall scores. It is possible that the participants truly recalled only approximately 1/3 of the information from their tinnitus appointment correctly. Unfortunately, it was not feasible to pilot the interview questions used prior to commencing the study. So the validity and reliability are unknown, as potential measurement error. This could have influenced the results obtained. Furthermore, it is

in the heterogeneous nature of tinnitus that some of the questions asked required specialized answers for the particular participant. For questions 2, 3, and 5, some participants were provided with more things to remember than others e.g. cause of tinnitus and things to do to help sleep/concentration/communication when tinnitus is affecting it. It is possible that the participants who needed to remember more information had greater difficulty correctly recalling the items. Short-term memory is very limited in capacity. Well-educated adults are only able to store approximately seven items at a time (Doak et al., 1996).

This is further supported by the fact that participants achieved between 52.1% and 64.6% on average correct for Q1 (Cause of tinnitus) and Q4 (Treatments for tinnitus), which required only one to three items of information to obtain 100%. This is within the number of items adults can remember in the short term, even for those with a lower health literacy level who may only be able to store up to three items at a time (Doak et al., 1996). For Q2 (Make tinnitus better), Q3 (Make tinnitus worse), and Q5 (Improve specific issues) the mean percent correct was only between 15% to 24.1%. The number of correct items of information for these questions ranged from three to eight (mean number of items to remember = 6.2).

In a typical healthcare appointment patients will be expected to remember a great deal more than one to three pieces of information. It is unrealistic to expect clients to remember a vast amount of information after only being exposed to it once (Doak et al., 1996). Written and visual aids at an appropriate readability and suitability level that can be taken home to review. Cueing at the following appointment to ensure that the clinician understands what the patient comprehended from the last session would be a useful practice. For example, at the first follow up

after an initial tinnitus consultation a clinician may ask, "What is the main thing you remember from last time?" or, " What are some things you can do to help tinnitus? We talked about them last time." This way, the clinician could gauge how much information the patient has retained from their last appointment and proceed accordingly, especially if there are some salient points that were missed.

A limitation of this study was that as participants only recalled around 1/3 of information from their initial tinnitus appointment, there was very little room to show deterioration over time. It was however, clear that there was no improvement.

It is unknown whether participants read the tinnitus resources (Brochure 1 and/or Brochure 2) that were provided prior to their initial appointment. Participants were also not asked whether they had or had not read the brochures, therefore it was not possible to measure recall in relation to the information in the brochure(s). A difficult factor for this was that while all participants were given Brochure 1, only a few were provided with Brochure 2, which is longer and provides additional information. These brochures contained information that would have supported what was discussed at the initial appointment. This, in turn may have affected recall for those who had read them at the short-term follow up.

There was also only a short time in between interviews, which does not measure whether the information would be retained over a longer period of time and be committed to memory. It will be important to further examine patient recall, not only in tinnitus, but for audiology and other healthcare professions as well. It would be beneficial to keep the period between appointments more standardized. This can be difficult within a real clinic environment. For this study follow up interviews were scheduled whenever the participant returned for their second appointment, which

varied between 7 to 18 days. It is also important to note that the aim of this study was to assess "recall" which is different to testing patient "comprehension". Future research should also address whether patients truly understand the medical information provided, for example by restating in their own words the concepts described by their medical professional.

Correlations performed on demographic variables and total recall scores were not statistically significant, and therefore may have occurred due to chance. The calculated effect sizes also fell well below the specified effect size of $d = 1.0$. There was, however a general trend towards a larger amount of the variance in age and education explaining the variance in short-term recall, than in immediate recall. If this was found to be repeatable in future studies, there may be a true relationship between these demographic variables and recall.

Correlations performed on audiometric variables and total recall scores were also not significant, and the calculated effect sizes fell below $d = 1.0$. Once again, this non-significance means any relationship may be due to chance. No trend was found between immediate recall, short-term recall, or any of the audiometric variables investigated. One potential reason for the correlations failing to reach statistical significance could be due to a small sample size of eight participants.

4.5.1 Age

There is a general supposition that older participants may have recalled information less accurately than younger participants, and for episodic information this is true according to Kessels and De Haan (2003). For this study participants were required to use their episodic memory, and while no statistically significant correlation was found, there was a trend towards increased age accounting for recall

more in the short-term, than immediately. This may be because older adults memory fades more rapidly than younger counterparts, and in a clinical practice setting may mean that clinicians should not wait a long time after an informational appointment to seek the patient's decision (Kessels, 2003).

Using more homogenous participant groups to investigate any age-related effects on recall would be more useful. For example, examining the recall of a group of younger adults and a separate group of older adults following an initial audiological appointment. The present study's participants mean age was 55 years, and included only two participants over the age of 65.

4.5.2 Anxiety

According to Kessels (2003) anxiety may affect patients' ability to recall medical information. Attentional narrowing can occur where patients' focus on one salient point e.g. 'this is a chronic condition which cannot be cured' and have limited capacity to take in other information. Another phenomena is state-dependent learning, where patients are able to remember more if they are in a similar psychological and physical state to when they were given the information e.g. high anxiety at the time of learning and recall, or low anxiety at the time of learning and recall (Schramke & Bauer, 1997).

In this study, anxiety was measured via the Tinnitus Reaction Questionnaire (TRQ) which evaluates the impact tinnitus has on a tinnitus sufferer's quality of life where a higher score equates to a higher level of reaction/anxiety to related to tinnitus. In this study, all correlations performed on audiometric variables and total recall scores were non-significant, and the calculated effect sizes fell below $d = 1.0$. There was no trend between appointments, and it appears that anxiety did not play a role in

participant recall. However, having a small sample size and a heterogeneous group of participants may be one reason no significant correlation was observed. The TRQ scores in this study were highly variable, ranging from 19 to 95 (mean = 54.87). This large range of scores could have obscured the ability to detect a relationship between anxiety and recall. This could be improved on with a large sample size of participants separated into three different groups, low, mid, and high anxiety.

A potential confounding factor was that anxiety levels were not measured at the time of both interviews, only at the first appointment. Therefore, it is impossible to tell which participants experienced similar levels of anxiety at the first and second appointment. As mentioned above, participants varied greatly on anxiety levels at the first appointment, it is unknown whether the level of distress associated with tinnitus increased or decreased by the second appointment. This could have severely affected the ability to determine whether anxiety impacts significantly on patient recall. Future studies would benefit by measuring anxiety at every testing occasion.

4.5.3 Tips to facilitate patients' memory for medical information

To facilitate patients' memory for medical information in the short term (Doak et al., 1996) it is important not to include unnecessary extraneous information as the more is included the less will be remembered. Also, gaining the attention of the patient before presenting information is important. Another way to help patients' remember information is by "chunking" the information into seven items or less.

Other tips are presenting the most important points without unnecessary extraneous information. To move information into patients' long-term memory (Doak et al., 1996) try to: review and summarize information, use patient interaction with new information, and relate new information to knowledge the patient already has.

4.6 Themes

From the most to least prevalent, themes identified from the first interviews were: Hearing aids, Understanding/Empowerment, Masking/Music therapy, Hope/Positive, Cost, Unaware, and Anxious. Prevalent themes from the second interviews included: Hearing aids, Cost, Hope/Positive, Music therapy, Annoyed/Frustrated (regarding tinnitus), and Understanding/Empowerment. These themes were primarily taken from Q6 and Q7, focusing on what the client thought was the most salient point from the initial appointment, and how they felt about their tinnitus immediately following the initial tinnitus appointment.

Across both appointments there was definitely a focus on tinnitus treatments in participants' answers to the final two interview questions, whether the participants had contributed meaning units to masking and music therapy or hearing aid options. Potentially, the participants may have felt that this was the most important information to them, therefore the most salient (Kessels, 2003). The most prevalent theme across both interviews was hearing aids, with seven out of eight then six out of eight referring to needing hearing aids. Interestingly, concern regarding cost of treatment was brought up by three more patients at their second interview than at the first. It may be that over the one to two week period between interviews, participants had the time to reflect on the cost of their potential treatment. After being exposed to a great deal of new information, it may have taken time to come to terms with the potential treatment and to therefore express concerns regarding the cost. Encouragingly, half of the participants expressed hopefulness or positive feelings towards their tinnitus, either in general, or about potential benefits from treatment. It may be that while participants were hopeful and positive that they may obtain some

benefits from the lifestyle changes discussed or from tinnitus treatments there was concerns about whether the potential benefits outweighed the cost.

4.6.1 Patient empowerment

A particular theme of interest was empowerment or increased understanding. The effect of this was most apparent immediately following the initial tinnitus appointment, with five out of eight participants contributing meaning units. By the second appointment only two participants contributed to the theme.

Empowering patients increases their sense of self-efficacy, and facilitates critical thinking and patient autonomy (R. M. Anderson & Funnel, 2010). This relates back to the SAM factor learning stimulation and motivation discussed in Doak et al., (1996). It is important to motivate people to learn by ensuring they feel confident in their own abilities to carry out their medical advice, whether at an appointment or from a patient education resource.

Providing information about tinnitus e.g. what it is and how it can be treated made a difference for the participants in this study. Feelings such as hope, positivity, and empowerment were all encouraging themes to see. It is unsurprising that participants responded well to patient education regarding tinnitus as information-based treatments such as CBT and TRT seem to have the strongest base of evidence to recommend them at this time. Smith-Gabai (2007) explains that it is the job of health-care practitioners to facilitate patients to develop skills required for becoming autonomous and independent and overcoming healthcare obstacles. A meaning unit from Participant 6's first interview nicely sums up the benefits of patient empowerment, 'the more one knows and understands about the problem, the easier it is to embrace and live with.'

4.7 Future research and limitations

A limitation of this study was the structured nature of the interviews with participants. The scope of this study was primarily focused on recall, readability, and suitability of tinnitus information presented in a verbal or written mode. Therefore, there was less of an opportunity to focus on participant themes. The sample size was determined via a priori analysis for the quantitative part of the study and as a result it is unknown whether additional themes would have been discovered had more participants been included. Future qualitative studies could further investigate these themes further using the process of saturation to determine the number of participants required.

4.8 Conclusion

Over half of New Zealanders have inadequate health literacy skills to meet the demands of everyday life and work (Ministry of Health, 2010) and individuals are likely to forget 40 to 80% of what medical professionals tell them, with over half of what is recalled being incorrect (Kessels, 2003). It would follow that it is crucial to provide verbal and written medical information that is at an appropriate level to encourage health literacy and promote the best outcomes for patients. The majority of patient healthcare information investigated in audiology thus far does not meet the internationally recommended 5th to 6th grade level (Atcherson et al., 2014; Atcherson et al., 2013; Atcherson et al., 2011; Laplante-Levesque et al., 2012), and the few suitability studies completed suggest that resources are generally only adequate or unsuitable due to high readability levels (Caposecco et al., 2014; Shieh & Hosei, 2008).

The current study suggests that for tinnitus patients the situation appears similar. Participants only remembered around 30% of the information from their initial tinnitus consultation, the resources analysed were above the ideal readability levels, and at either an adequate or unsuitable suitability level. The current literature and the results from this study do not suggest that patients are receiving appropriate and easily understandable resources or that their health literacy is being facilitated to achieve optimum health outcomes to succeed in the healthcare system. It is evident that there is a great need for more research in patient recall, readability, and suitability of resources for patients in all areas of healthcare to work towards better understanding of how to ensure patients understand and remember verbal and written health information to obtain the best outcomes and patient satisfaction.

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Appendix 1: Patient questionnaire

University of Canterbury

Department of Communication Disorders

Private Bag 4800

Christchurch 8140

New Zealand



Name _____

Date _____

PARTICIPANT INFORMATION

We'd like to know more about you and your tinnitus (noises in your ears/head not caused by sounds around you). Please answer the questions below as best you can.

1. What is your current age? _____

2. What is your current gender? _____

3. At what age did you first notice you have tinnitus? _____

4. How quickly did your tinnitus start? (Please circle one choice)

- a. Very quickly
- b. Somewhat quickly
- c. Somewhat slowly
- d. Very slowly

5. How loud is your tinnitus (1 = very soft and 10 = extremely loud)?

6. How much does your tinnitus bother you? (1 = not at all and 10 = a lot)

7. How would you describe the sound(s) you hear? (e.g. ringing, buzzing)

8. Where does the sound come from? (Please circle one choice)

Left ear

Right ear

Both ears

Head

9. If known, what is the cause of your tinnitus?

10. What (if anything) have you tried to help your tinnitus? (E.g. medication, counselling)

11. If anyone in your family has had tinnitus, please list their relationship to you.

12. Do you have hearing problems?

13. If anyone in your family has had hearing problems, please list their relationship to you.

14. Have you ever worn hearing aids?

a. If so, at what age did you start wearing them?

b. How many hours per day do you wear them (if at all)?

c. How would you rate your level of satisfaction with them? (Please circle one choice)

1. Not at all satisfied

2. Somewhat satisfied

3. Somewhat dissatisfied

4. Totally dissatisfied

d. How much do they help with your tinnitus (Please circle one choice)

1. They help a lot

2. They help somewhat

3. They make it somewhat worse

4. They make it much worse

15. How many years did you attend school? (including polytech, university, etc.)

16. What is your annual net income (after any taxes, etc.)? _____

Appendix 2: Interview questions

Name _____

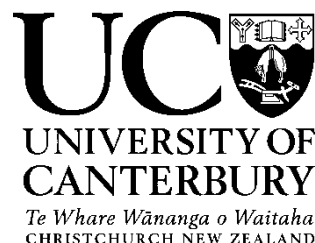
Date _____

INTERVIEW QUESTIONS

1. What do you think caused your tinnitus (HL vs. non-HL patient)?
2. Please describe some things which can make tinnitus better.
3. Please describe some things that can make tinnitus worse.
4. What are some available treatments to help tinnitus?
5. What are some things you can do to improve your concentration/sleep/communication?
6. What is the main thing you have learnt from today?
7. How are you feeling about your tinnitus now that you've had your appointment?

Appendix 3: Information sheet

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New Zealand



STUDY INFORMATION

You are invited to participate as a participant in the Master's research project entitled **"Patient recall of tinnitus information after initial audiological assessment."**

The goal of this project is to find out how much information adults with tinnitus remember after their first appointment with their audiologist. This study will also aim to find out how much information adults with tinnitus retain by their next appointment. It is important to find out how much information and what particular information clients remember from their appointments. This would allow audiologists to change their practices to present information in more effective ways in the future to help patients retain important medical information. Currently, there are no studies looking at how much information tinnitus patients remember. Previous research has shown that many things can affect how much people remember after medical appointments, including age and anxiety.

Your involvement in this project will include: (1) participating in a five minute interview answering questions about your tinnitus appointment (2) answering a questionnaire about your tinnitus, and some demographic information (3) participating in a second short interview right before your next tinnitus appointment.

You have the right to withdraw from the project at any time, including withdrawal of any information you have provided. Your involvement (or withdrawal) in this project will not affect your ability to seek and receive services at the hearing aid clinic where your hearing is tested.

You will be asked about your tinnitus appointment and a risk of participating in the study includes the possibility of feelings of distress as you participate in your interview. A list of available support services is provided at the end of this document.

The interview will be recorded via audiotape and a transcript will be provided to you for inspection. Any feedback that you provide that the audiologist will receive will be strictly confidential. You may receive a copy of the project results by contacting the researcher at the conclusion of the project.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation. To ensure confidentiality, your name will not be used on your interview sheet or questionnaire. Instead you will be given a participant number (ID). These participant numbers will be used in the study, with no identifying information. In addition, the consent form will be kept in a locked cabinet in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand. Electronic data (interview recordings) will be kept on password-protected computers that are stored in a locked room in the Department of Communication Disorders on the University of Canterbury campus in Christchurch, New Zealand. The data from this study will be destroyed in five years time. As this study will be submitted as a Master's thesis it will be publically available through the University of Canterbury Library.

This project is being carried out by Kate Logan, who is a Master of Audiology second year student. Dr Rebecca Kelly-Campbell, the supervisor for this study, will be pleased to discuss any concerns or questions you may have about participation in the project and may be reached on 64 (3) 364-2987 x 8327.

The project and been reviewed **and approved** by the University of Canterbury Human Ethics Committee. The Human Ethics Committee can be contacted at University of Canterbury, Okeover House, Christchurch and on 03-364-2987.

Available support services:

NZ Tinnitus and Hyperacusis Support Network

<http://www.tinnitus.org.nz/>

Phone: 09 923 6316

Email: tinnitus@auckland.ac.nz

The Hearing Association

www.hearing.org.nz

Phone: 0800 23 34 45

Email: enquiries@hearing.org.nz

The National Foundation for the Deaf Inc.

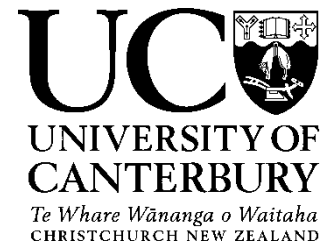
<http://www.nfd.org.nz/95/Tinnitus>

Phone: 0800 867 446

Email: enquiries@nfd.org.nz

Appendix 4: Patient consent form

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



Researcher: Kate Logan

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

Date: 18.03.2014

Consent Form

Patient recall of tinnitus information after initial audiological assessment

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

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

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

Name: (please print): _____

Signature: _____

Date: _____

Appendix 5: Ethics consent



HUMAN ETHICS COMMITTEE

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

Ref: HEC 2014/15

28 April 2014

Kate Logan
Department of Communication Disorders
UNIVERSITY OF CANTERBURY

Dear Kate

The Human Ethics Committee advises that your research proposal "Patient recall of tinnitus information following intitial audiological assessment" 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 19 April 2014.

Best wishes for your project.

Yours sincerely

A handwritten signature in black ink, appearing to read 'L MacDonald'.

Lindsey MacDonald
Chair
University of Canterbury Human Ethics Committee