

https://dspace.org/

Hearing device use and tinnitus retraining therapy for clients with tinnitus: assessing the benefits in a private practice in Johannesburg, South Africa

Swart, Duone Rochelle

2018
https://hdl.handle.net/10539/32778

Downloaded from a DSpace repository. https://dspace.org/

CD NOT READ

HEARING DEVICE USE AND TINNITUS RETRAINING THERAPY FOR CLIENTS WITH TINNITUS: ASSESSING THE BENEFITS IN A PRIVATE PRACTICE IN JOHANNESBURG, SOUTH AFRICA

A MASTERS DISSERTATION PRESENTED TO

THE DISCIPLINE OF SPEECH PATHOLOGY AND AUDIOLOGY

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT

FACULTY OF HUMANITIES

UNIVERSITY OF THE WITWATERSRAND

JOHANNESBURG

IN PARTIAL FULLFILMENT OF THE REQUIREMENTS FOR THE DEGREE M.A. AUDIOLOGY BY RESEARCH REPORT

M.A. AUDIOLOGY

BY

DUONÉ ROCHELLE SWART

SUPERVISED BY: MRS LIEPOLLO NTLHAKANA

MARCH 2018

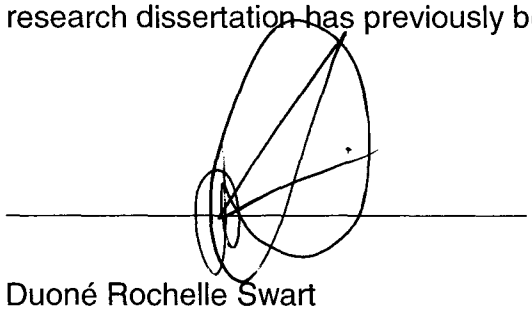
Acknowledgments

I would like to thank the following research contributors for their input into this research, although they shall remain anonymous to protect their patient/carer confidentiality. Without them this research would have been possible.

I would like to thank Mrs Liepollo Ntlhakana, my research supervisor, for her professionalism and knowledge, without her guidance, this research would not be rich and valuable. Thanks mom and Michael, your support and love has been the anchor in my life.

Declaration

I, Duoné Rochelle Swart, declare that this research dissertation is my own work, except when indicated differently by the references and acknowledgements. I am responsible for the content of this research dissertation and the conclusions presented. No part of this research dissertation has previously been submitted for a degree to a different University.



Duoné Rochelle Swart

Abstract

Background: Hearing devices have been used as a tool for treating tinnitus since the 1940's. In the same way, tinnitus retraining therapy (TRT) has been used to treat tinnitus originating from various causes successfully. A variety of research focuses on each of the above-mentioned treatment options, but few researched the combination of these two treatment methods. In addition, no current research exists for a South African population, relating to the benefits of these treatments used together.

Purpose: To assess the benefits of treating tinnitus using a combination of tinnitus retraining therapy and hearing devices, using the tinnitus handicap inventory (THI). To identify themes within the 25 THI items and how they affect the daily functioning of the client experiencing tinnitus.

Methods: A quantitative, non-experimental, cross-sectional design was used for this research study. The research sample included 29 clients, who were fitted with hearing devices and received accompanying tinnitus retraining therapy. Clients were seen in private practice settings in Johannesburg, South Africa. Clients were seen by TRT trained audiologists. Clients completed the THI after each TRT visit. Descriptive statistics and a statistical z-test was used to analyse the scores obtained from the THIs. Thematic analysis was used to analyse 25 THI items. Ethical clearance was obtained to conduct the study before data collection commenced.

Results: The findings of this research showed that n=10 clients received 3-6 THI and hearing device therapy sessions. For these participants, a combination of TRT and hearing device use was successful in treating their tinnitus. The mean score for the first THI was 50,55 and the mean score for the last THI was 29,31. Statistical z-test results showed a statistically significant different between the first and last THI scores and supported the null hypothesis. Analysis of the 25 items of the THI showed that quality of life experienced by the client is adversely affected by tinnitus.

Conclusion: The results for this study indicated that to receive benefit from a combination of TRT and hearing device use, the client must attend at least 3-6 consecutive TRT and hearing device sessions. TRT and hearing device use therapy should be provided within a team setting. Tinnitus influences the functional activities of the client, closely followed by influences on their emotional state.

Key Words: Tinnitus, tinnitus retraining therapy, hearing devices, Tinnitus Handicap Inventory.

Table of Contents

Acknowledgments i
Abstract iii
Chapter 1: Introduction 1
Introduction 1
Rationale for the Study 1
Chapter 2: Literature Review 5
Introduction 5
Anatomy of the Auditory System 5
Hearing Loss 8
Tinnitus 12
Treatments for Tinnitus Associated with Hearing Loss 12
Hearing Devices 13
Tinnitus Retraining Therapy 18
Additional Tinnitus Treatments 20
Challenges for Tinnitus Treatment in the SA Context 20
Conceptual Framework for the Study 24
Hypothesis and Research Questions 25
Chapter 3: Methodology 26
Introduction 26
Main and Sub-Aims 27
Research Design 27
Sampling Procedures 28
Inclusion and Exclusion Criteria 28
Description of Participants 29
Bias 32
Data Collection Process 32
Data Analysis 34
Ethical Considerations 34
Chapter 4: Results and Discussion 38
Introduction 38
Results 39
Chapter 5: Conclusion 57
Introduction 57
Summary of Results 57
Critical Evaluation of Study 60
List of References 61
List of Tables 43
Table 1 43
Table 2 44
Table 3 44
Table 4 44
Table 5 44
Table 6 45
Table 7 45
Table 8 46
Table 9 47
Table 10 52
Table 11 54
Table 12 55
Table 13 56
Table 14 57
Table 15 57
List of Appendices 75
Appendix 1 75
Appendix 2 76
Appendix 3 77
Appendix 4 78

Appendix 5..... 79
Appendix 6..... 81
List of Figures..... 12
Figure 1..... 12
Figure 2..... 24

CHAPTER 1

Introduction

The opening chapter of this research provides an introduction and orientation to the study. This chapter discusses key concepts relating to a rationale for this research and background information that initiated the development of the study, as well as its relevance to the field of audiology. The chapter will discuss important terminology relating to key concepts discussed in the chapters to come. Lastly, a description of each of the following chapters will be provided.

Background and Rationale for the Research

Audiological management of tinnitus has involved the use of hearing devices (McNeill, Tavora-Vieira, Alnafjan, Searchfield & Welch, 2014). The benefit of using hearing devices for the treatment of tinnitus has been documented since the late 1940's (McNeill et al., 2014). Eggermont (2007) indicates that audiologists have only recently begun to understand the physiological causes of tinnitus and using sound-based therapies to treat it.

Tinnitus retraining therapy (TRT) is a treatment protocol used by audiologists to identify, treat, and manage various types of tinnitus with which clients may present with (Davis & Rafaie, 2000).

There also exists a lack of information regarding the treatment of tinnitus, particularly within the South African population (Moroe & Khoza-Shangase, 2014). It is thus important for South African audiologists to research treatment methods used for tinnitus management, to assess their value in treating clients within the private practice setting.

Hearing devices have also been known to improve tinnitus by means of masking tinnitus and therefore improving tinnitus experienced by clients, while also treating hearing loss (Dillon, 2012). Researchers have explored the use and effectiveness of both these treatment methods individually, but few have explored the combined effect of these, especially not in the South African context. Research relating to tinnitus is scares, especially in African countries, thus, it will be valuable to have data for an African country.

This research had therefore aimed at assessing the benefits of hearing device use in combination with tinnitus retraining therapy, within a private practice setting in Johannesburg, South Africa.

Definitions of Key Concepts

Hearing Devices

Hearing devices are small electronic devices that are usually made up of three main parts, a microphone, amplifier and speaker. They are used to increase the loudness and clarity of incoming sound, so that a person with a hearing loss can hear more effectively (Dillon, 2012).

Tinnitus

Tinnitus is the perception of sound, produced by the ears, experienced by a person, because of certain factors. The sounds are usually described as ringing, buzzing or pulsating and can only be heard or perceived by the person experiencing the tinnitus (Tyler, 2011). Chapter 2 discussed the epidemiology of tinnitus in more detail.

Tinnitus Retraining Therapy

Tinnitus retraining therapy was developed by Pawel J. Jasterboff. It is a clinical manner of implementing Jasterboff's neurophysiological model of tinnitus and focuses on counselling the person experiencing tinnitus on how to manage the tinnitus effectively, whilst also incorporating sound generators, to mask tinnitus (Jasterboff & Hazell, 2008).

Hearing Loss

Hearing loss is defined as a loss of auditory sensitivity, which can result in reduced ability to hear every day sounds, particularly speech sounds. Hearing loss can affect children and adults and has a variety of aetiologies (Dugan, 2003). Different types of hearing loss can be defined. These include conductive hearing loss, involving typically the outer and middle ears, sensorineural hearing loss, which affects the inner ear, mixed hearing loss, which affects the outer, middle and inner ear and unilateral hearing loss, which affects one ear only.

Hearing loss is diagnosed by an audiologist and ENT doctor, using an audiological test battery which consists of otoscopy, which involves examining the outer ear and portions of the middle ear using an otoscope ear light, tympanometry, which involves testing of the middle ear space, eardrum and Eustachian tube, Reflex threshold testing, which measures the contraction of the stapedial muscle, pure tone and bone conduction audiometry and speech audiometry (Del Bo & Ambrosetti, 2007).

Gold Standard

Bryan (2010) defines a Gold standard as "a perfected test or thing which serves to stand as a point of reference against which other tests or things may be measured" In terms of tinnitus, a Gold standard for treating it has not yet been established.

A list of abbreviations is provided:

TRT	Tinnitus Retraining Therapy
THI	Tinnitus Handicap Inventory
ENT	Ear, Nose and Throat

EBM	Evidence Based Medicine
CBT	Cognitive Behavioural Therapy
THQ	Tinnitus Handicap Questionnaire
TSI	Tinnitus Severity Index
THT	Tinnitus Habituation Therapy

Chapter Layout

This research thesis will be presented in 5 chapters. These chapters include:

Chapter 1: This chapter has provided a general overview of the key concepts discussed in this research thesis, a rationale for the research, as well as outlining the chapters following it.

Chapter 2: This chapter focuses on the theoretical framework for this research. It commences with an overview of the anatomy of the auditory system, an explanation of hearing loss, tinnitus and hearing devices, evidence-based practice guidelines for tinnitus treatment and then looks at international studies conducted regarding tinnitus retraining therapy and hearing device us for the treatment of tinnitus. It concludes with the research hypothesis and research questions.

Chapter 3: The research methodology implemented is discussed in chapter 3. The chapter commences by discussing the main and sub-aims, the research design that was utilized and the context of the study. This is followed by a description of the participants and concludes with the ethical considerations for the research.

Chapter 4 provides a detailed description of the results that were obtained for the study. The results were critically discussed, as per the research aims that were defined in chapter 3.

Chapter 5: This chapter provides a summary of the finding for the research. It then critically evaluates the research. The chapter closes off by discussing the implications of the research and provides recommendations for any future studies.

The research thesis also contains a list of important appendices. These are the tools used to collect data and play an important role in understanding how the data was collected, as well as for replication of the study.

CHAPTER 2

LITERATURE REVIEW

Introduction

Chapter 2 will provide an overview of the literature which is relevant to this research study. The literature review focuses on the anatomy of the auditory system, hearing loss, tinnitus and its various relating factors, tinnitus retraining therapy, evidence-based practice and other types of tinnitus treatments that are available. International research relating to tinnitus retraining therapy and hearing device use for treating tinnitus is also critically discussed and argued during this chapter. The chapter ends by highlighting the current challenges faced in South Africa regarding tinnitus treatment and tinnitus treatment selection for a South African population, as well as defining the hypothesis and research questions for this study.

Anatomy of the Auditory System

The anatomy of the auditory system will be explained in more detail below.

The external ear consists of the pinna or auricle, the external auditory canal and the outer layer of the tympanic membrane or ear drum (Alcamo & Bergdahl, 2003). The middle ear marks the space between the ear drum and start of the inner ear.

It contains three small ossicles or bones of hearing, the Malleus, Incus, and Stapes. The middle ear is also connected to the throat via the Eustachian tube, which allows for pressure changes to occur within the middle ear (Alcamo & Bergdahl, 2003). This middle ear space also contains the stapedial muscle, which contracts in response to loud auditory stimuli.

The inner ear is a system divided into a bony labyrinth section and a membranous labyrinth section. Between the bony and membranous labyrinths, there exists fluid called perilymph (Alcamo & Bergdahl, 2003). The bony labyrinth is then further divided into three main parts, Firstly, fluid filled sacs, responsible for maintaining equilibrium. The second part consists of three semi-circular canals which are also linked to balance functions. The third part consists of a shell-like organ known as the cochlea. The cochlea is linked to the middle ear via an attachment to the stapes via a membranous section called the oval window (Alcamo & Bergdahl, 2003).

When sound vibrations enter the ear, the vibrations are transferred to the ossicular chain. The vibrations are then sent to the perilymph within the cochlea, and as this fluid moves, it activates a sensory response. This sensory response is then relayed to the auditory nerve (VIII cranial nerve) (Alcamo & Bergdahl, 2003).

The cochlea makes three turns around a bony core section. The cochlea is then divided into three chambers, namely, the scala vestibuli, the cochlear duct and the scala tympani (Allen & Harper, 2011). The scala vestibuli and scala tympani are continuous with one another and are also filled with a perilymph fluid. The cochlear duct forms part of the membranous labyrinth and is filled with endolymph fluid. This is a particularly important section of the cochlea because it contains the spiral shaped organ of corti.

The organ of corti sits on a membrane known as the basilar membrane and contains thousands of microscopic hair-like cells. These cells are then covered by another membrane, known as the tectorial membrane. During sound stimulation, the basilar membrane is activated and begins to move. These movements force the bundles of hair cells (which are receptors for frequency specific auditory information)

to move into the tectorial membrane. This action causes sensory neurons to activate and to send nerve impulses to the auditory nerve. The nerve then directs these impulses towards the brain, where the sound is interpreted (Allen & Harper, 2011). When these delicate hair cells become damaged, they are no longer able to send sensory input to the auditory nerve.

Hearing Loss

Hearing loss is described as a decrease in auditory sensitivity (Eggermont, 2017). This loss in auditory sensitivity can lead to difficulties in hearing environmental and speech sounds. Hearing loss is often accompanied by certain factors, for example, ear ache, ear discharge, vertigo (a form of dizziness), aural fullness and tinnitus. Hearing loss can be categorized according to laterality, symmetry, degree, configuration and type (Snow, 2004). Hearing loss occurs when there is damage to parts of the auditory systems as described in the anatomy section of this chapter.

Different types of hearing losses exist due to damage to these parts of the ear. These include conductive hearing losses, which impede the sound from entering the ear and making its way to the cochlea and nerve (Snow, 2004). Conditions which may cause a conductive hearing loss includes middle ear infections, outer ear infections, Cholesteatomas, which are large masses of infectious debris which fills the middle ear spaces, ossicular chain discontinuity and perforated ear drums (Eggermont. 2017).

Sensorineural hearing losses affect the Cochlea and auditory nerves found in the inner ear (Hoare, Edmondson-Jones, Sereda, Akeroyd and Hall, 2012). This is typical caused by age-related changes in the inner ear or noise exposure (Snow, 2004).

Mixed hearing losses occur when there is a combination of conductive components and sensorineural hearing loss present, for example, an elderly patient with an age-related sensorineural hearing loss, whom also present with a middle ear infection (Snow, 2004).

Hearing loss is often associated with symptoms such as reduced sensitivity for hearing speech, especially in the presence of noise, hypersensitivity to sound or an

abnormal growth in loudness known as recruitment and tinnitus (Simmons, Dambra, Lobarinas, Stocking & Salvi, 2008).

Tinnitus

Tinnitus is described as a noise heard by a client, which is not perceived by other listeners (Simmons, Dambra, Lobarinas, Stocking & Salvi, 2008). Tinnitus itself is not defined as a condition but is a symptom of an underlying condition such as a hearing loss, ear infections, circulatory system difficulties such vestibular illnesses and excessive cerumen build up. (Baguley, McFerran & Hall, 2013).

There is also the question of whether somatic (Trigeminal) tinnitus is the same as tinnitus induced by poor cochlear functioning. Somatic tinnitus refers to tinnitus which is caused by a source other than the inner ear and beyond. For example, somatic tinnitus is usually related to severe difficulties with the muscles of the neck (Folmer & Griest, 2003). It has been suggested that individuals who have experienced severe head or neck injuries often complain of markedly loud and disturbing tinnitus (Folmer & Griest, 2003). Another example of somatic tinnitus relates to individuals experiencing difficulties with temporomandibular joint disorders (TMD) (Folmer & Griest, 2003). These studies did not comment on clients who have perhaps experienced the same tinnitus symptoms but did not have serious head trauma or temporomandibular disorders.

Risk factors for tinnitus include clients who present with a hearing impairment, increasing age of the client, male clients, and the level to which the client is exposed to noise occupationally or recreationally (Snow, 2004). It is important to understand that dysfunction of the inner ear structures contribute to the development of tinnitus. However, the tinnitus itself depends on cortical processes occurring within the brain of the client.

There also exists a sub group of tinnitus, namely, exogenous tinnitus and endogenous tinnitus (Bope and Kellerman, 2013). Exogenous tinnitus refers to tinnitus which cannot benefit from masking noises from the background. Clients who experience this type of

tinnitus may display normal pure tone audiometry results or may have regular deficits of their hearing thresholds, but there is no maskable tinnitus.

Endogenous tinnitus refers to tinnitus that has maskable properties (Bope and Kellerman, 2013). Clients who experience endogenous tinnitus may report that they prefer covering the tinnitus with external sounds. When investigating endogenous tinnitus, the audiologist can explore three zones of tinnitus that can easily be identified within the client's hearing field. These are: Low tone tinnitus, which occurs at or below 750Hz, Mid-frequency tinnitus which occurs at 1000Hz to 2000Hz and high frequency tinnitus, which can be present at or above 2000Hz until 10 000Hz or in some cases, up to 12 000Hz (Bope and Kellerman, 2013).

In some individuals, tinnitus can be described as intermittent or constant. In cases where clients suffer from severe and constant tinnitus, they can develop feelings of anxiety and depression and may also lead to concentration problems (Moller, Langutth & DeRidder, 2010).

There are a variety of factors which may cause tinnitus. These include (Lawrence, 2015): Cerebrovascular accidents (CVAs or Strokes), allergic reactions, ruptured eardrum, Meniere's disease, low blood pressure, high blood pressure, head, or neck injuries, certain auditory tumours, aneurysms near the ear, arteriosclerosis of the arteries near the ear, thyroid difficulties, diabetes, smoking and caffeine use, ear infections and hearing loss (Lawrence, 2015).

A clinical framework is provided for audiologists manage tinnitus (Collins, 2007). This framework assists audiologists in identifying, diagnosing and finally using a combination between hearing devices and TRT (which is the clinical implementation of the neurophysiological model suggested by Jasterboff & Jasterboff in 1990).

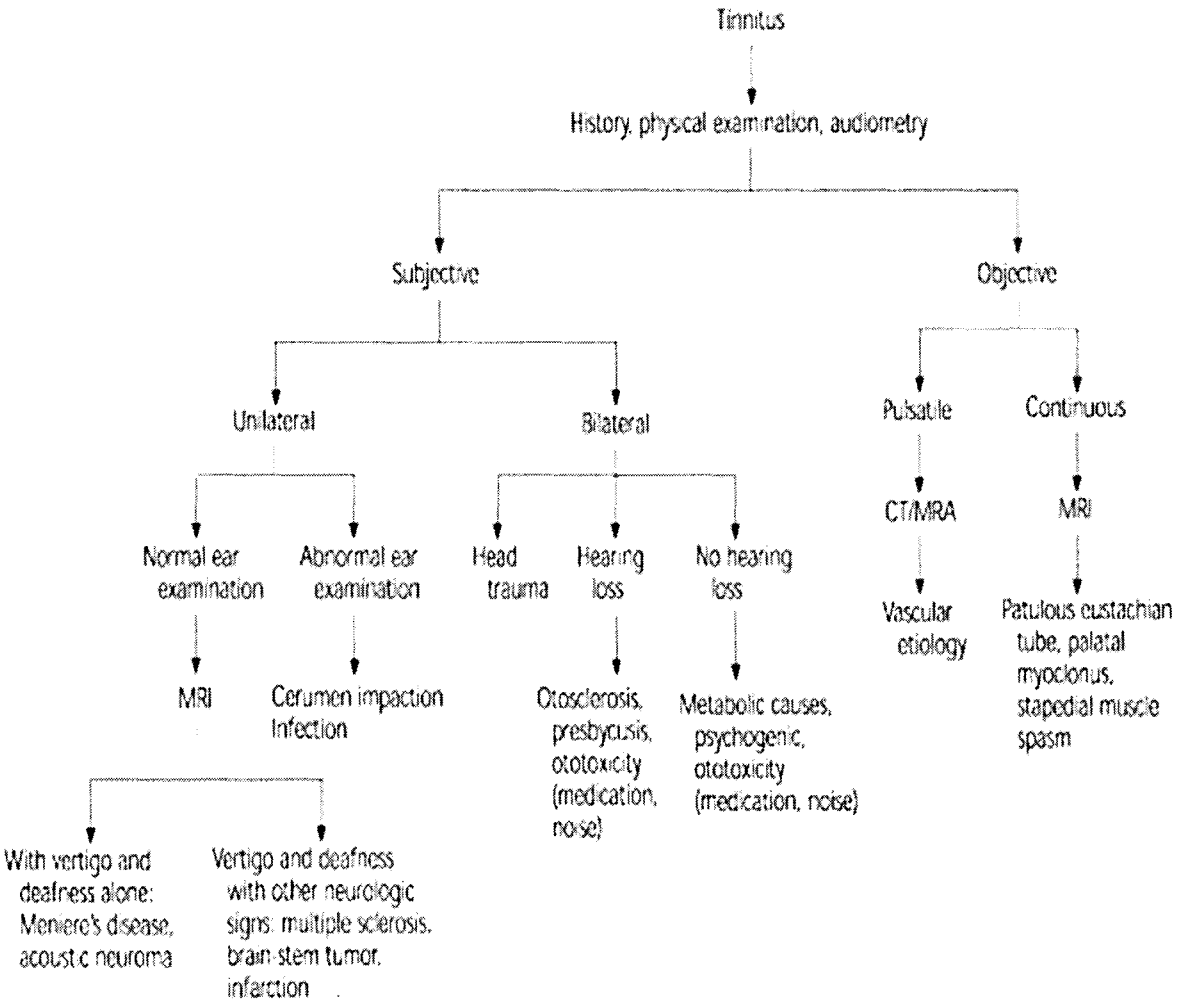


Figure 1: Tinnitus diagnosis clinical framework. Collins (2007).

According to Jasterboff and Hazell (2008), tinnitus has been notoriously difficult to treat, due to the misunderstanding of its aetiology. In fact, Berrios and Rose (1992), chose to define tinnitus as meaningless hallucinations. Berrios and Rose (1992) explained that tinnitus was to be treated as physiological or otologically, rather than psychologically.

However, Jasterboff and Hazell (2008) continue to explain that due to the misconceptions regarding tinnitus as not having psychological effects, it may have been possible that counselling, which forms an important part of treating tinnitus, may have been omitted. This may indicate why counselling may at times be omitted from the treatment plan and why a medical paradigm is accepted and thus, hearing devices are the main option, when providing tinnitus treatment.

Researchers now know that tinnitus has a significant impact on the quality of life experienced by clients (Szczepek & Mazurek, 2017), and that counselling is a critical component when treating clients experiencing tinnitus (Jasterboff & Hazell, 2004).

There is also evidence that shows that only 5 to 15 % of individuals will contact the correct professionals to address their problems with tinnitus (Eggermont, 2012). This may be due to the misconception that tinnitus cannot be treated or that there is no cure for tinnitus (Kochkin & Richards, 2003).

This information indicates a gap in the field of tinnitus therapy, particularly pertaining to the counselling aspect relating to tinnitus treatment. It demonstrates that clients are not well informed regarding where to seek assistance for their difficulties (Eggermont, 2012).

This research has aimed at providing proof that counselling and hearing device use makes for a successful treatment combination and that informing the client about their tinnitus is crucial in the treatment thereof.

Treatment for Tinnitus Associated with Hearing Loss

When clients have received a diagnosis of hearing loss, several different treatment options can be made available to treat their hearing loss (Schaub, 2011). If the nature of the hearing loss is medical, the client can be referred to the ear, nose and throat (ENT)

specialist for medical treatment, such as medication or surgical correction of the otological difficulty (Snow, 2014). If the hearing loss is related to other causes, such as age-related hearing loss (presbycusis), noise induced hearing loss, genetic factors or other causes, the client can be treated by means of appropriate amplification. This usually comes in the form of hearing devices (Snow, 2014).

Hearing Devices

Hearing devices are small, electronic devices, which comprise of three main components: a microphone, an amplifier and a speaker (Schaub, 2011). These three components, alongside other digital features, allow for appropriate sound amplification, allowing a person with hearing loss to hear sounds better (Dillon, 2012).

Hearing devices do not recover lost hearing, but allows for appropriate levels of amplification, which can improve the client's ability to hear important sounds, namely speech sound (Wentzel, 2016). Hearing devices stimulate the hearing system and prevents further damage to the inner ear from occurring. Hearing devices have also been a treatment option for tinnitus (Wentzel, 2016). This is because hearing devices have a masking effect on the tinnitus, thus, improving the awareness of the tinnitus.

There are different styles and strength of hearing devices available (Schaub, 2011). The audiologist selects the hearing devices based on the audiological results. Hearing device styles may include the following styles: Behind-the-ear with an ear mould, receiver-in-the-canal, in-the-ear, completely-in-the-canal and behind-the-ear with a slim tube (Schaub, 2011).

According to McNeill et al. (2014), hearing devices alter the perception of tinnitus in the following ways: (a) Improves the client's hearing abilities, which leads to improved quality of life, (b) reduction in attention given to tinnitus by the brain and (c) uses ambient noise to mask out the tinnitus. Schaete and Kempter (2006), present a strong argument for the use of sound to counter act damaging neuroplastic changes which occur following permanent damage to the peripheral hearing system. The argument suggests that damage done to the

peripheral auditory system, i.e. hearing loss, can result in changes to the central nervous system.

According to Kochin and Tyler (2008), 60% of clients reported some relief of their tinnitus when using hearing devices, 22% of clients reported major relief of their tinnitus while wearing their hearing devices and less than 2% of clients experienced worsening of their tinnitus while using their hearing device. Kochkin and Tyler (2008) also indicate that 10 % of audiologists who fitted these clients dedicated at least 10 minutes to counselling the clients about their tinnitus.

The study by Kochkin and Tyler (2008) supports the concept that treating tinnitus using a combination of hearing devices and counselling is an effective tool for improving the client's perception of their tinnitus, thus reinforcing the main aim of this research study, which is to assess the benefits of tinnitus retraining therapy and hearing device use.

Del Bo and Ambrosetti (2006), indicated that there was a 51% change in tinnitus handicap inventory (THI) scores when fitted with open fit hearing devices, within a three-month period. These results are indicative of an improvement experienced in tinnitus. However, this study only shows results for clients only being treated using hearing devices.

No tinnitus retraining therapy was conducted during the study conducted by Del Bo and Ambrosetti (2006). Perhaps if tinnitus retraining therapy had been incorporated as part of these clients' treatment plans, the reduction seen in THI scores could have been greater, as seen in the study conducted by Kochkin and Tyler (2008).

Trotter and Donaldson (2008) reported results for a longitudinal tinnitus therapy study, which was conducted over a twenty-five-year period. According to this research, tinnitus improvement increased from 39 % between 1980 and 1999 to 65% between 2000 and 2004. This may be attributed to the improved hearing device technology that has been developed in the early 2000's (Schaub, 2011).

However, Trotter and Donaldson (2008), did not report on whether this tinnitus improvement was due to hearing device fittings only, or whether there were other treatment options being used at the same time, for example, a counselling aspect, as with TRT.

This demonstrates the need for a research study which assesses both tinnitus retraining therapy and hearing device use being used simultaneously, for the treatment of tinnitus, which is the main aim of this study.

McKenna and Irwin (2008) noted that due to a paucity in information relating to guidelines for treatment and the absence of a clear Gold standard of treatment for tinnitus, it is important that the audiologist can provide the client with all the information regarding the

reasons why a combination between hearing devices and counselling is an option for treating their tinnitus.

This paucity in information and lack of a Gold standard for treating tinnitus is also the reason conducting this study is of significance, as it will provide information for a South African group of clients and provide South African based audiologists with a method of successfully treating this population. More information is thus required to assist audiologists dealing with tinnitus to combine both TRT and hearing devices and to critically interpret the results obtained from the tinnitus handicap inventory to improve clinical outcomes or their clients.

During a study of 823 tinnitus clients from Bad Kissingen in Germany, clients underwent in-client rehabilitation therapy for 12 weeks to treat severe tinnitus. During their treatment, these clients were asked to identify which type of tinnitus they perceived, for example, pulsating tinnitus, roaring tinnitus, whistling tinnitus, or hissing tinnitus (Bope & Kellerman, 2013).

The study indicated that clients complained the most of factors such as fatigue (63,9%), insomnia (69,5%), headaches (69,0%), exhaustion (59,0%) and forgetfulness (68%). These results show that clients experienced factors that can affect quality of life in a significant manner (Szczepek & Mazurek, 2017). The study did not note what treatment was involved during the 12-week rehabilitation therapy, whether it involved only medical intervention or whether counselling was also included. The study also did not comment on clients experiencing mild to moderate tinnitus, which although less severe, can still influence the client's experience of quality of life.

A study conducted by Searchfield, Kaur and Martin (2010), explored how hearing device fittings in combination with counselling improved tinnitus. The results obtained from the study were sourced from 58 participants whom attended the University of Auckland's tinnitus and hearing clinic.

These participants were then divided into two groups, one group for tinnitus counselling and one group for tinnitus counselling and hearing device use. The study was done in the form of a questionnaire based retrospective review of treatment success. The results of the study indicated that tinnitus handicap questionnaire (THQ) results showed a large improvement in some participants, and a mild to no improvement in others.

The study does not, however, provide an in-depth discussion with regards to the items within the THQ, to understand why some clients may have experienced a worsening of results. No explanation was provided as to why such a trend may have occurred in the data set.

This is important to explore, as it may indicate mild invalidity of the questionnaire being used to evaluate changes in the perception of tinnitus, or to re-explain certain questions within the item, so that clients are providing an accurate reflection of changes perceived in tinnitus. It may indicate the use of a more psychometrically robust tool, such as the tinnitus handicap inventory (THI).

The THI was used for the current research study, due to its excellent test-retest reliability (Newman, Sandridge & Jacobson, 1998) and its success as a psychometrically robust tool for assessing changes in perceived tinnitus, which is what this study has attempted to establish.

This Searchfield et al. (2010) study also did not investigate how different styles of hearing devices influence changes in tinnitus. Hearing devices were selected solely on the gain required to overcome the hearing loss the client presented with. The authors indicated in the article that further studies are required to indicate if different hearing device styles influence changes on tinnitus.

This study also uses the term "counselling tool" when describing the counselling portion of their study. The authors have not clearly defined what areas are included in the counselling tool. This is important information to include, to guide audiologists in being knowledgeable regarding what needs to be counselled on.

Tinnitus retraining therapy includes a strong focus on counselling, and the counselling aspect is well-developed, intensive, individualized and interactive (Jasterboff & Jasterboff, 2000). If the counselling tool is not well-developed and well-utilized by the treating practitioner, a poor therapeutic outcome could result (Jasterboff & Hazell, 2008).

Tinnitus Retraining Therapy

Tinnitus retraining therapy is the clinical implementation of the neurophysiological model that was developed by Jasterboff and Jasterboff in 1990. TRT works by habituating tinnitus events caused by various factors (Jasterboff & Jasterboff, 1990). TRT has two main components: 1). Educational counselling- This is done as per the client and 2). Sound therapy: For example, noise generators. Not hearing devices (Jasterboff and Hazell, 2008).

In an article written by Jasterboff and Jasterboff (2000), they have indicated that there are currently no scientific studies demonstrating the outcome of TRT. In fact, the only efficacy results that exist for the outcome of TRT, are based on results from clinical practice and these were discussed extensively at the 6th International Tinnitus Seminar in Cambridge, United Kingdom, in 1999. This still holds true in literature today, as discussed by Jasterboff and Hazell (2008).

Furthermore, in the 2000 article by Jasterboff and Jasterboff, a variety of studies were discussed, relating to the success seen when using TRT clinically. Studies conducted by Sheldrake, McKinney, Lux-Wellenhof, Bartnik and Herraiz respectively, indicated between 80% and 88% success rate when using TRT to treat tinnitus (Jasterboff & Jasterboff, 2000). Jasterboff and Jasterboff (2000) explained that even though there exists several book chapters and articles surrounding TRT, there remain gaps in information, particularly gaps in the use of sound therapy for audiologists.

This research is thus of high value to the understanding of important therapeutic concepts within TRT, especially since the research focused on using hearing devices in combination with TRT, which is a form of sound therapy, which in the article from Jasterboff and Jasterboff, is a short coming in their understanding of sound therapy and TRT.

TRT is strongly based upon a counselling paradigm (Jasterboff & Hazell, 2008). The reasoning behind implementing a counselling section, is due to the strong psychological reactions which clients experience due to bothersome tinnitus (Szczepek & Mazurek, 2017). Clients have been known to experience anxiety, anger, fatigue, exhaustion and other psychological factors, because of their tinnitus (Szczepek & Mazurek, 2017). It is thus important to reflect upon the psychosocial factors relating to tinnitus and tinnitus treatment.

A study which reflected on this was conducted by McNeil, Tavora-Vieira, Alnafjan, Searchfield and Welch (2012). Their study investigated the use of hearing devices for the treatment of tinnitus. No other treatment was provided to the study participants, which consisted of 70 clients whom attended the Healthy Hearing and Balance care in Sydney, Australia.

The results of this study revealed that hearing devices are indeed an effective tool for treating tinnitus, especially if the client has good hearing ability for low-pitched sounds, demonstrates a strong emotional or psychological reaction to tinnitus and the tinnitus pitch falls within the fitting range of the hearing device which is fitted for the client (McNeil et al., 2012).

This study explained that each participant received counselling during treatment, but that changes seen in tinnitus was not due to the counselling component, but rather because of the tinnitus masking effect produced using hearing devices.

The researchers did not, however, include what areas the participants were counselled on and did not provide a tool which could measure the effects of counselling alone. Their statement relating to the results obtained being solely due to tinnitus masking may thus not reflect the most accurate interpretation of the results, as counselling was not used during treatment. The study also discusses how each participant's personality may influence tinnitus perception and that some individuals may be more susceptible to tinnitus because of certain psychosocial reasons.

The study subsequently comments on how psychosocial factors are linked to hearing device satisfaction. This assumption is problematic, as the researchers did not formally investigate hearing device satisfaction and psychosocial factors, and thus commenting on these areas is inappropriate. Researchers should only comment on results obtained from data collected and analysed as part of their methodology. It may have been more useful to further investigate the way counselling played a role in their results, which in turn would guide audiologists in how to use counselling as it is also used in TRT.

Additional Tinnitus Treatments

Although a variety of treatment options are available, for example, cognitive behavioural therapy (Artz, George, Stokroos & Vermeire, 2012), cochlear implants, relaxation techniques, Neuromonics (Davis, Paki & Hanley, 2007), dietary adjustments (Rossi, De Capua, Ulivelli, Bartalini, Falzarano, Filippone & Passero 2007) and so forth, there is little evidence of their success, nor is there a Gold standard for the treatment of tinnitus.

Challenges for Tinnitus Treatment in a South African Context

There also exists the dilemma of a South African context, where the necessary resources required to conduct tinnitus retraining therapy may be scares. Thus, it is important

to explore treatment options that yield good treatment results, but which may be more resource conservative.

A study conducted at Ealing Primary Care Trust Audiology Department in London by Aazh, Moore and Glasberg (2008) explored such a simplified form of tinnitus retraining therapy. For this study, data was collected from 42 clients whom underwent this form of treatment for a period of 3-23 months consecutively. Simplified tinnitus retraining therapy consists of a shorter duration of counselling and sound generators were not mandatory.

The results for the study indicated a significant reduction in the tinnitus handicap inventory, which indicated that clients will also benefit from a simplified form of tinnitus retraining therapy. These studies could perhaps be attempted in a South African population, to understand if they will have any value for treating tinnitus in this varied client load.

According to a study conducted by Moroe and Khoza- Shangase (2014), few South African studies have been published regarding the impact of tinnitus on the quality of life of the clients whom experience it.

Moroe and Khoza-Shangase (2014) indicated the importance of high-quality assessments being conducted by audiologists to improve the quality of life which clients with tinnitus experience.

The researchers have recommended that further studies relating to tinnitus should be conducted and thus a study investigating tinnitus retraining therapy and hearing device use would tie in well with how the tinnitus handicap inventory measures quality of life.

Another recent South African tinnitus study conducted by Kroon (2017), indicated that audiology and psychology are to complement each other, when treating tinnitus. Kroon (2017) indicated in the study that counselling and hearing devices used as a combination treatment for tinnitus is considered specialist tinnitus treatment. Furthermore, Kroon (2017) noted that due to the serious psychological effects that tinnitus may have on a client, specialist tinnitus care is highly recommended and indicated.

In South Africa, a lack of academic research exists to rationalize the selection of treatment for the population of clients treated. It is therefore important to understand how quality of life is affected by tinnitus and more importantly, what treatment works most effectively in improving treatment outcomes for the clients.

Conceptual Framework of the Study

A conceptual framework consists of a logical and step-by-step design (Ravitch & Riggan, 2016). A conceptual framework explains why a study is important to the field and why the chosen methods used to study it, is appropriate (Ravitch & Riggan, 2016).

This study is based upon the conceptual framework set out by the International Classification of Functioning (ICF) model of disability and health and how the neurophysiological model of tinnitus and hearing device use links to it, this explains the research questions and methodology selected for the current research.

The ICF is a conceptual framework that was designed to explain the relationship between the impairment that is caused by a health condition and the effects that this condition has on the client's social well-being and daily activities (WHO, 2008). The ICF considers how the impairment affects the client and does not only focus on their disability (WHO, 2008).

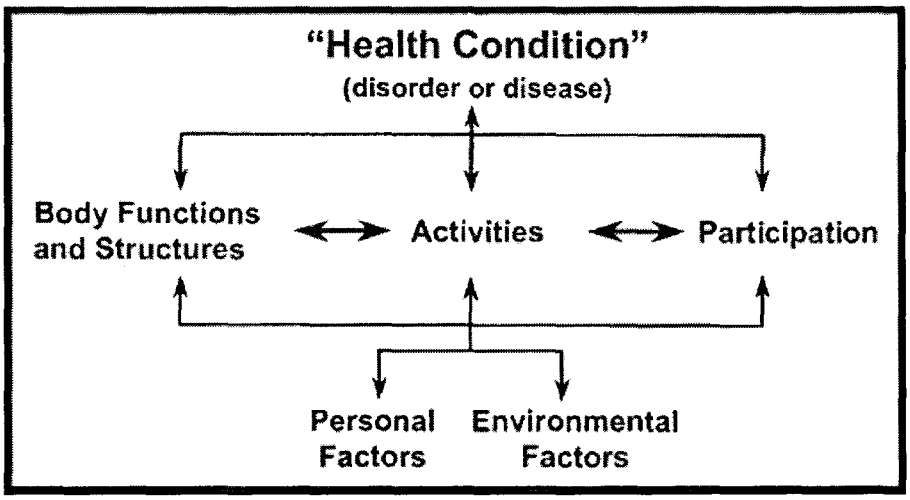


Figure 2: ICF Model of Disability (WHO, 2008).

To frame tinnitus within an ICF model, the body functions affected by tinnitus are the inner ear and the cortical areas of the brain (Evered & Lawrenson, 2009). The client's activities are affected by the bothersome activities, causing anxiety, anger, exhaustion and even depression (Szczepek & Mazurek, 2017). Due to these reactions, client's participation in daily activities becomes adversely affected (Szczepek & Mazurek, 2017). These reactions are then also influenced by environmental and personal factors (WHO,2008). For example, the client's environment is adversely affected due to a lack of participation in daily activities, because of bothersome tinnitus. Personal factors which may play a role in how the client experiences tinnitus may include personality traits, susceptibility to depression and anxiety and social factors (WHO, 2008). Using the ICF conceptual framework supports the concept of combining hearing devices and TRT, as it is essentially a combination between treating tinnitus using a medical solution (hearing devices) and using counselling to treat the social factors that arises because of tinnitus. This address the daily activities of the client experiencing tinnitus and ensures audiologists do not only treat the medical factors relating to tinnitus but treats the client holistically.

The ICF conceptual framework has thus guided the hypothesis and research questions.

Hypotheses

When tinnitus retraining therapy is used in conjunction with hearing devices, client THI scores would decrease and clients would have perceived a positive change in their tinnitus.

Research Questions

- What were the clients' perceptions of their tinnitus before and after receiving tinnitus retraining therapy?
- Did TRT in combination with the use of hearing devices lower tinnitus handicap (THI) scores?

CHAPTER 3

METHODOLOGY

Introduction

This chapter provides a detailed explanation of the chosen methodology of this research study. The chapter describes the main aims of the study, sub-aims of the study and research design of the study. This section will explain the participants, site selection, data collection, statistical analysis, reliability and validity of the study and ethical considerations of the study.

Research Aims

Main Aim

The main aim of the research was to assess the self-perceived changes in client's tinnitus, in a private practice setting, after receiving consecutive sessions of tinnitus retraining therapy in conjunction with the use of hearing devices.

Sub Aims

- To determine the client's perceived tinnitus score, using the THI, after attending consecutive TRT sessions and combined hearing device use.

- To explore themes within the 25 THI items and the effects they have on self-perceived changes in the client's experience of their tinnitus.

Research Design

For the purposes of this study, a non-experimental, cross-sectional research design was selected. Furthermore, a quantitative research data collection method was chosen, as it allows the researcher to collect and analyse data in an objective manner (Bernard & Ryan, 2010). When a researcher uses quantitative methods to collect data,

it allows for the collection of numeric information, which can indicate the presence of relationships between different research factors (Wentzel, 2016).

When using a non-experimental paradigm for research, the researcher has no direct control of the variables being studied (Wentzel, 2016). The purpose is to observe the research variables, and by observing them, the researcher can comment on trends and changes seen in the variables (Wentzel, 2016). In this study, a non-experimental approach was used, to decrease researcher bias. The researcher does not have the power to alter or change research variables in this case. The research focused on 25 the client's hearing loss classification, types of hearing devices used, scores obtained from the 25 THI items following TRT and hearing device sessions.

Context

The research was conducted at two private audiology practices in Johannesburg, South Africa. These audiology practices focused on hearing loss diagnosis, selection of hearing devices, and provision of tinnitus retraining therapy. The audiologists who participated were trained post-graduate in TRT.

At these audiology practices, the clients were seen for an initial diagnostic audiological evaluation. During the diagnostic evaluation, the audiologist can determine the hearing thresholds of the client, thus, establishing the type, configuration and degree of the hearing loss with which the client presents. The diagnostic hearing test information was critical when treating a client experiencing tinnitus, and for the selection of hearing devices which were appropriate in style and strength (Ariizumi, Hatanaka & Katamura, 2010). The audiologists at the audiology practices used a TRT protocol when treating TRT clients (Appendix 3). It must also be mentioned, that even though a TRT protocol is available, appendix 3), each client was treated individually and according to their lifestyle needs. This research focused on assessing how beneficial the combination of TRT and hearing device use was during tinnitus treatment.

Participant Selection and Description

Sampling Procedure

Convenience sampling was used as the sampling procedure. Convenience sampling refers to a method where participants are selected based on their easy accessibility to the researcher (Sim and Wright, 2000). A convenience sample is often used as the sampling procedure when time and resources are limited. When using convenience sampling, it was important to take into consideration whether the sample will be theoretically representative of the entire sample (Sim and Wright, 2000). When using a convenience sampling technique, it was important for the researcher to describe the characteristics of the sample clearly and in detail, so that others can make a judgement regarding the its external validity (Sim and Wright, 2000).

For this study, the research participants were selected based on their qualifications as trained TRT audiologists and clients were selected using inclusion and exclusion criteria, however, these clients were treated by the TRT trained audiologists. The sample was thus convenient to obtain, as the clients were readily available at each of the participating TRT trained audiologist's practices and if they fitted into the inclusion criteria of the study.

Although this sampling method provided the benefit of being convenient, the researcher only assessed the benefits of TRT and hearing device use in tinnitus clients, the results of the research may not be easily generalized to other contexts.

Inclusion and Exclusion Criteria

The researcher defined certain inclusion and exclusion criteria that participants had to meet, to be included in this study. These inclusion and exclusion criteria are discussed below:

Inclusion Criteria

TRT Trained Audiologists:

- Received further post graduate training in the field of tinnitus retraining therapy (For example, the Tinnitus Masterclass offered in Denmark or the UK). The tinnitus masterclass course was selected as a factor in selecting audiologists, as it provided a standard of treatment that would be the same between two different audiologists, thus providing a reliable outcome. The coursework for the Tinnitus masterclass includes:

- Tinnitus and hyperacusis rehabilitation
- Paediatric tinnitus and hyperacusis rehabilitation
- Specialist cognitive behavioural therapy focused on tinnitus and hyperacusis management
- Evidence-based practice
- Service development
- Management of a tinnitus & hyperacusis rehabilitation service
    - Have had three to five years of clinical experience in the treatment of tinnitus.
    - Currently working in a private audiology practice setting in Johannesburg, South Africa.
    - Currently treating tinnitus clients.

Clients Participating:

- Clients must have undergone an initial audiological hearing assessment.
- The client must have had complaints of tinnitus.
- The client would have had to present with a hearing loss (30dB or below).
- The client must have received hearing devices.

Exclusion Criteria

Exclusion Criteria for Audiologists:

If the audiologists did not meet the requirements set in the inclusion criteria, they were disqualified from participating in the study.

Exclusion Criteria for Clients:

- The client had not undergone an initial audiological evaluation.
- The hearing assessment results indicated hearing loss, but the client had no complaint of tinnitus.
- The client did not require hearing devices.

Description of Participants

The researcher identified three (3) TRT trained audiologists, employed in the private practice setting, by using a Facebook post on a professional audiology page. Of the three identified TRT audiologists, only two (2) audiologists provided consent to participate in the study.

These TRT audiologists were asked to treat at least 15 clients each, using TRT and hearing devices, as per the TRT protocol (Appendix 3). The clients were to be selected by the TRT trained audiologists, based on the inclusion criteria defined by the researcher. The TRT audiologists were informed prior to data collection, what the client inclusion and exclusion criteria were by the researcher. Any clients which did not meet the inclusion criteria, were eliminated from the study as participants. However, eliminated clients were still provided treatment by the audiologists as per their individual cases. A total of 29 clients were treated, 12 by one of the TRT trained audiologists and 17 by the other TRT trained audiologist.

Equipment and Measures

Equipment

The TRT audiologists made use of their own otoscopes, tympanometers, audiometers, response buttons, ear phones, sound proof rooms and hearing device

programming computers and software to conduct diagnostic audiology tests and hearing device fittings.

Reliability and Validity of Audiometric Testing and Equipment

The TRT trained audiologists conducted hearing assessments in audiological testing rooms that were consistent with the guidelines for audiological testing equipment, as per the strict guidelines for equipment functioning and calibration set out by the American National Standards Institute (ANSI), particularly the ANSI 3.6- 2010 guidelines for audiometers, headphones, response buttons and bone conduction vibrators (Roeser, Valente & Rosford-Dunn, 2007). By following these guidelines, the audiological test battery is reliable and repeatable and valid.

Measures

Tinnitus Handicap Inventory

The Tinnitus handicap inventory (THI), developed by Newman & Colleagues in 1996 was used to measure client's experience of tinnitus. The 25-item inventory questionnaire evaluates tinnitus and measures the impact of tinnitus on the client (Appendix 4). The THI has a scoring range between 0-100 and lists different categories of tinnitus handicap as per the score obtained by the client. The client is required to complete the THI by answering either yes, no or sometimes to a series of tinnitus and lifestyle related questions. Each answer then adds up to a grand total,

which was interpreted as the client's tinnitus handicap, which measures the severity of the client's tinnitus. The THI was given to clients to complete by the TRT trained audiologists during the data collection process.

Validity and Reliability of the Tinnitus Handicap Inventory

The researcher made use of the tinnitus handicap inventory to assess the perceived changes of tinnitus. Newman, Sandridge and Jacobson (1998), conducted a study that evaluated the psychometric adequacy of the tinnitus handicap Inventory. The results indicated that this tool is a brief, easily administered and psychometrically robust measure that evaluates the impact of tinnitus on daily living. Thus, using this tool for conducting data collection is a valid and reliable measure.

Newman, Sandridge and Jacobson (1998), noted the excellent test-retest reliability and repeatability of the THI and noted that it has excellent clinical use in the detection of changes that clients may perceive in their tinnitus handicap. In addition to this, the THI pre- and post-administrative scores can be utilized as criterion measures for tracking tinnitus management efforts.

Internal validity refers to the extent to which an experiment is done well, allowing the researcher to select one explanation of a phenomenon over another, with a high degree of confidence (Lavrakas, 2008). Newman, Jacobson and Spitzer (1996), conducted a study using the THI to establish its internal validity. They concluded that the THI yielded excellent internal validity and reliability, with a Cronbach's alpha value of 0.93. Considering these results, the researcher used the THI as a reliable and valid tool to conduct the research with. The two participating TRT trained audiologists made use of the THI for this study. This allowed for good test-retest reliability.

Bias

According to Maxwell (2005), research bias refers to a systematic error in which research findings or theories are not based on the true findings of the study, due to certain influences.

During this study, clients were asked to respond to questions relating to treatment being provided to them. In cases such like this, acquiescence bias can occur (Sarniak, 2015). Acquiescence bias occurs when participants tend to respond positively to whatever the researcher presents to them (Sarniak, 2015). To prevent this type of bias from occurring, the researcher was not involved in their therapeutic process, thus avoiding the possibility of them responding falsely positive to TRT and hearing device use as a treatment method for their tinnitus and thus not providing a true reflection of the changes seen in their THI scores.

Another form of bias that was present in this study, was inclusive bias. Inclusive bias refers to a type of research bias where participants are selected for convenience and do not include a wide demographic group (Maxwell, 2005). Due to convenience sampling being used as the sampling procedure for this study, the research did not take into consideration participants from a broad population. The population was limited to the clients treated at the two audiology practices used as research sites. Suri (2005), notes that having inclusive bias in a study is not ideal, however, it can be accepted, if the researcher understands and acknowledges that the sample is not representative of a wider demographic.

Data Collection Processes

The following steps were taken to collect data for this research study:

- The researcher provided two (2) TRT trained audiologists with the following items: A file containing blank THI forms, client information sheets, audiologist information sheet, client consent forms and audiologist consent forms, which they were asked to read and sign.

- The TRT audiologists were asked to show clients the information sheet and consent sheets provided for them. If clients met the inclusion criteria, they signed the consent form and was included in the study.
- Following this, the TRT audiologists treated the clients using TRT and hearing devices once the client had undergone their diagnostic hearing evaluation and hearing device fittings.
- Following each TRT session, the client was asked to complete a THI.
- Clients selected by the audiologists attended at least 2 TRT and hearing device sessions.
- The TRT audiologists then kept the completed THIs in the client's file.
- Once the client completed all their sessions, the TRT audiologists returned all the completed and tallied THIs to the researcher, for data analysis.
- The THI scores were then captured onto an excel spreadsheet and analysed according to different statistical procedures.

Data Analysis

THI Analysis

To analyse information obtained from using the THI, the researcher made use of descriptive statistics. Descriptive statistics is defined as a method of quantitatively describing the main features of a set of information or data (Nick, 2007).

The researcher also used a z-test to establish if there was a statistically significant change in THI scores, at the first and last administration of the THI questionnaires following TRT and hearing device use. Furthermore, a z-test was used test whether TRT and hearing device use was a successful treatment option for clients experiencing tinnitus.

Hypothesis testing is a way to conclude if results from a test were valid or repeatable (Wasserman, 2004).

A z-test was conducted in the following way:

- The sample size was greater than 29.
- Data points were independent from each other. In other words, one data point wasn't related or didn't affect another data point.
- Sample sizes were equal.

Running the Z-test on the data required these five steps:

1. Stating the null hypothesis (H0) and alternate hypothesis (H1): H0: TRT in combination with hearing device use, had a significant improvement on THI scores, and therefore influenced tinnitus improvement. H1: TRT in combination

with hearing device use, had no significant impact on the THI scores and therefore had no effect on tinnitus improvement.

2. Chose an alpha level: 5% or 0,05.

3. Calculated the z test statistic.

4. Compared the test statistic to the critical z value and decided if it supported or rejected the null hypothesis.

Ethical Considerations

Ethical clearance was applied for via the medical ethics committee (HREC) of the University of the Witwatersrand (Protocol Number: M170325, Appendix 6) and was granted.

Confidentiality and Anonymity

According to Marshall and Rossman (2011), it is important to ensure that all participants in this study had their identities protected. Wentzel (2016), highlighted the importance of adhering to the standards defined by the world medical association (WMA), when researching. These standards include ethical clearance from a statutory body, consent provided by the research participants, the right to confidentiality and anonymity, permission obtained from the relevant research sites and safe keeping of data (WMA, 2013).

All THI forms completed by clients were anonymous. The TRT audiologists did however, allocate each client with a client number, for their own record keeping. The TRT audiologists could not unfortunately remain anonymous, as they had to meet the researcher and assist in conducting therapy with clients. However, confidentiality in terms of their practices was adhered to during the research process. Additionally, any

identifiable information in terms of their names and practice details was kept anonymous by the researcher.

The THI forms were kept in safe keeping by the researcher once they had returned from the participating audiologists. The researcher was not present during the treatment process and therefore, client anonymity was adhered to.

Benefits of Participating in the Study

Clients that agreed to participate in this research study enjoyed the following benefits:

- Treatment for their hearing loss (1).
- Cerumen management when it was needed (2).
- Treatment for their tinnitus (3).
- Referred to the appropriate professionals, e.g. psychologist or ENT doctor (4).

Risks for Participation in this Study

There existed the possibility of clients experiencing consequences because of tinnitus, such as anxiety, depression and anger. It was important for the participating audiologists to have counselled clients on the possibility of these feelings becoming manifested as the treatment occurred and providing them with a referral to the appropriate professional, such as a psychologist or ear, nose and throat specialist (ENT).

CHAPTER 4

RESULTS AND DISCUSSION

Introduction

This section provides a detailed description and overview of the results obtained from the data collection process. The results are discussed in accordance to the research aims. The chapter will highlight and explain causative factors seen in the results obtained.

Client's Perception of Tinnitus, Following TRT and Hearing Device Use

The first sub-aim of the research study was to assess the client's perception of tinnitus, following consecutive sessions of TRT and hearing device use. The changes in their tinnitus perceptions were measured by using the THI.

The clients were asked at each TRT session, to complete a THI scale and to score the items afterwards. Their score was then indicative of their perception of the tinnitus. The THI tinnitus scale is described in more detail below:

Table 1: Tinnitus Grading Scale

0-16	Slight or no handicap	Grade 1 Tinnitus
18-36	Mild Handicap	Grade 2 Tinnitus
38-56	Moderate Handicap	Grade 3 Tinnitus
58-76	Severe Handicap	Grade 4 Tinnitus
78-100	Catastrophic Handicap	Grade 5 Tinnitus

Newman, Sandridge & Jacobson (1998).

The THI results indicated a mean score of 40,48, Moderate handicap (Range= 53; SD: 15,86).

Minimum THI Score: 2 (Slight or no handicap), Maximum THI Score: 70 (Severe Handicap).

Client Demographics

The table below demonstrated the client demographics for this study.

Table 2: Client Demographics

Client Demographics	**n= 29**
Average age	45
Males	68%
Females	31%
English First Language Speakers	87%
English Second Language Speakers	13%

Below is a summary of the participants' types of hearing loss, degree of hearing loss, style of hearing devices fitted, laterality of the hearing losses and types of hearing devices fitted:

Table 3: Types of Hearing Loss

Type of Hearing Loss	**Number of Participants (n=29)**
Sensorineural Hearing Loss	89,65%
Conductive Hearing Loss	13,44%
Mixed Hearing Loss	6,89%

Table 4: Degree of Hearing Loss

Degree of Hearing Loss	Participants (n=29)
Mild	41,3%
Moderate	51,72%
Severe	6,8%
Profound	0%

Table 5: Style of Hearing Devices

Devices Style of Device	Number of Participants (n=29)
Behind-the-ear with a mould	6,8%
Behind-the-ear with a slim tube	3,44%
In-the-ear	0%
In-the-canal	0%
Receiver-in-the-canal	89%

Table 6: Configuration of Hearing Losses

Configuration of the Hearing Loss	Number of Participants (n=29)
Sloping	89,96%
Rising	6,89%
Flat	3,44%
Irregular	0%

Table 7: Laterality of the Hearing Loss

Laterality of the Hearing Losses	n=29
Unilateral Fittings	34%
Bilateral Fittings	65,5%

Table 8: Types of Hearing Devices Fitted

Fitted Hearing Devices	Style
Widex U330 FFS	Receiver-in-the-canal
Widex D440 FS	Receiver-in-the-canal
Signia Pure 5 PX	Receiver-in-the-canal
Signia Pure 7 PX	Receiver-in-the-canal
Oticon Intiga 10	Receiver-in-the-canal
Unitron Moxi Fit	Receiver-in-the-canal
Unitron Quantum 2	Behind-the-ear

Discussion of Findings

The mean age of the clients seen in this study was 45 years of age. According to a study conducted by Ciminelli, Pinto, Sanchez & Tomita (2010), the average age of clients experiencing tinnitus is between 40 and 80 years of age. The current study found that 68% of the clients were male and 31% of the clients were female.

Ciminelli et al. (2010) used the THI as a tool for measuring tinnitus annoyance and based on these THI scores, found no relationship between gender and the level of tinnitus annoyance experienced by the clients. However, Hiller & Goebel (2006), found that there was a significant difference between males and females in terms of tinnitus annoyance levels, in terms of more males experiencing tinnitus annoyance, as compared to female clients. However, Hiller & Goebel (2006) made use of the mini tinnitus questionnaire to evaluate tinnitus annoyance and not the THI, as with this study.

The results indicated that 87% of the clients were English first language speakers and that 13% of the clients were English second language speakers. Wentzel (2016) noted that particularly in a South African context, that language barriers may cause a decreased retention of information or reduced understanding of information. However, the participating audiologists noted that all participating clients understood the English versions of the THI. The THI is available in an Afrikaans version, Lithuanian version, Portuguese version, Turkish version, Urdu version, Persian version, Danish version and Spanish version (Moller, Langguth & Hajak, 2007). The consensus was that the THI was a well-validated measurement tool, which is appropriate to use in many different cultural settings and socio-economic groups (Moller et al., 2007).

The results indicate that 89,65% of clients presented with a sensorineural hearing loss. A study by Negrila-Mezei, Enache & Sarafonleanu (2011), noted that tinnitus accompanies sensorineural hearing in 58,8% of clients. This was based on a study of 260 participants, ranging in age from 60 to above 75 years old. This indicates the high prevalence of tinnitus which accompanies sensorineural hearing loss and can advocate strongly for the use of hearing devices to treat tinnitus.

It was also indicated 89% of these clients were fitted with receiver-in-the-canal hearing devices. Del Bo and Ambrosetti (2006), indicated that there was a 51% decrease in client's tinnitus handicap inventory (THI) scores when fitted with open fit hearing devices. Del Bo & Ambrosetti (2006) also reported that to obtain the best result when using hearing devices as a treatment for tinnitus, it is advised to fit open fit hearing devices bilaterally, that have the largest fitting range possible. This study thus supports the results indicated in this study.

Dillon (2012), also reported that digital hearing aids are better at amplifying speech noise and dampening background noise, which assists the client in focusing away from the bothersome tinnitus and allows them to focus on useful sound input, which is essentially speech sound. This may show why the use of digital receiver-in-the-canal hearing devices were successful at assisting in treating tinnitus.

No recent studies have noted the names of the hearing devices used to treat tinnitus. It is thus difficult to compare results for this to international studies. The current study is one of the first studies to not specific hearing devices used for the treatment of tinnitus.

Trotter and Donaldson (2008) accredited the improvement in tinnitus because of digital hearing devices to their ability to selectively amplify high pitched sounds, have improved fitting ranges and flexibility, noise and feedback cancellers and tinnitus masking options.

Mayes (2010) has indicated that some styles of hearing devices, for example, a behind-the-ear hearing device with an ear mould, can cause tinnitus to seem louder, because of the hearing device occlusion effect. When hearing devices are occluding the ear, the natural sound may come across as muffled and the tinnitus can become

louder (Mayes, 2010). It is thus advisable to use a more open fitting hearing device style, for example, a receiver-in-the-canal hearing device. The open fit which is then provided, reduces the hearing device occlusion effect, which will minimize the loudness of the tinnitus.

Results indicated that 51,72% of clients experienced a moderate hearing loss, 41,3% experienced a mild hearing loss and 6,8% experienced a severe hearing loss. These results are contradictory to results obtained by Dias & Cordeiro (2010), which states that tinnitus annoyance becomes worse as hearing loss degree becomes worse. Their study used the THI as a tool for measuring tinnitus annoyance levels, as does this study. From this study, it appears that even clients experiencing mild hearing loss, can experience high levels of annoyance. This will be further discussed in relation to the table discussing client THI results (See table 9 and its discussion).

This research has indicated that 34% of clients were fitted unilaterally. Shrivastav (2014) indicated that unilateral hearing loss is often fluctuating in nature and can be medically treated, in some instances. This may explain the low prevalence of unilateral hearing device fittings completed during this study. Shrivastav (2014) also noted that if unilateral hearing loss cannot be medically resolved, it may progress to bilateral hearing loss eventually.

The client's THI scale results are discussed below.

Table 9: Client's THI Results

THI Results Client	Mean THI Score μ	Initial THI Score	Final THI Score	n= Number of TRT Sessions
Client 1	57,0	70	32	6
Client 2	57,0	66	48	2
Client 3	20,0	26	14	2
Client 4	19,0	24	14	2
Client 5	32,0	62	2	2
Client 6	48,67	66	24	3
Client 7	29,0	40	18	2
Client 8	50,0	48	16	6
Client 9	57,5	90	22	4
Client 10	38,0	58	18	2
Client 11	19,33	40	2	3
Client 12	53,0	58	48	2
Client 13	27,0	42	12	2
Client 14	55,0	59	34	5
Client 15	68,0	92	78	3
Client 16	15,0	24	6	2
Client 17	32,67	48	20	3
Client 18	34,0	34	33	4
Client 19	22,0	48	20	3
Client 20	53,0	62	44	2
Client 21	53,0	53	53	1
Client 22	28,0	40	16	2
Client 23	60,0	60	60	1
Client 24	29,0	40	18	2
Client 25	48,0	48	48	1
Client 26	32,0	32	12	2
Client 27	64,0	64	64	1
Client 28	22,0	22	22	1
Client 29	51,0	50	52	2

Discussion of Findings

The THI results indicated that 10 participants underwent 3 to 6 consecutive TRT and hearing device sessions. Furthermore, 14 participants attended 2 TRT and hearing device sessions and 5 participants attended 1 session. The average initial THI score for the first 10 participants was 50, 3, which indicated a severe handicap (grade 4). The mean final THI score for these 10 participants was 20,3, which indicated a mild handicap (grade 2). A South African tinnitus study conducted by Kroon (2017), noted that a 20-point drop in THI is deemed a clinically significant change in the THI score. For clients attending between 3 and 6 TRT and hearing device sessions, the mean drop in THI scores was 31,4. According to Kroon (2017), a drop in 20-points indicated

a clinically significant positive change in tinnitus perception, which supports the findings and shows that 3-6 TRT and hearing device use sessions is essential for observing clinically significant improvements in tinnitus.

The mean initial THI score for the 14 participants whom attended 2 sessions each was 44,5, which is a moderate handicap (grade 3). The mean final THI score for these clients was 23, which is a mild handicap (grade 2). The mean initial THI score for the 5 clients attending one session was 49,4, which indicated a moderate handicap (grade 3). The final THI score for these clients was 49,4. This indicated a moderate handicap (grade 3).

These results demonstrated that clients experiencing severe handicap tinnitus (grade 4), attend more TRT and hearing device sessions and that they benefited from a combination of TRT and hearing device use. This may be due to the severe bothersome nature of their tinnitus, that encourages them to have attended more counselling and hearing device sessions. The results indicated that clients experiencing moderate handicap tinnitus did not require as many sessions to improve their perception of their tinnitus. Clients who experienced no changes in their tinnitus only attended one session. Clients attending less than 2 sessions did not benefit from TRT and hearing device use, as there was no follow up with hearing device use or the maintenance and continuation of a counselling facet.

Jasterboff and Jasterboff (2000) refer to the psychoacoustic characteristics of tinnitus, as part of the neuropsychological model for treating tinnitus. This concept postulates that each client may perceive the severity of their tinnitus differently and that clients with the same audiological test results can experience the severity of their tinnitus very differently and thus the distress which the tinnitus causes (Jasterboff & Jasterboff, 2000).

This concept can explain why certain clients only attended one THI session and why others, may have attended up to 6 TRT sessions.

Ciminelli, Pinto, Sanchez & Tomita (2010) reported that there exists a strong correlation between the severity of tinnitus experienced and psychological factors, such as anxiety and depression. Clients with higher THI scores are at risk for developing these psychological factors and will therefore benefit from 3 to 6 sessions of TRT and hearing device use sessions, before a decrease is noted in THI scores, which is linked to improvements in psychological factors and activities of daily living (Ciminelli et al., 2010).

Research conducted by Moller, Langguth & Hajak (2007) showed that clients experienced significant improvements in their tinnitus following even just one month of consecutive TRT. This demonstrates and supports the importance of the audiologist counselling the client regarding attending 3 to 6 TRT and hearing device use sessions.

Furthermore, a statistical two sample z-test was conducted to identify whether there was a statistically significant difference between the THI results. The first THI treatment session was compared to the last THI session. The table below demonstrates the results obtained.

Table 10: Z-Test Results

	Initial THI	Final THI
Mean (μ)	50,55	29,31
Known Variance	315,7562	394,5788
Observations	29	29
Hypothesized Mean Difference	0	
Z-Value	4,29	
P(Z<=z) one tail	8,85	
Z Critical one tail	1,64	
P(Z<=z) two tail	1,77	
Z Critical two tail	1,95	

The null hypothesis stated that: "TRT in combination with hearing device use, has a significant improvement on THI scores, and therefore, influences tinnitus improvement"

For the null hypothesis to have been proved to be true, the results of the z-test must have been greater than the suggested 0.05 alpha level (Maxwell, 2005).

If the z-test result was less than the suggested alpha level of 0.05 (5%), the null hypothesis could be rejected (Maxwell, 2005).

The z-test for the THIs indicated a result of 8,85 and 1,77. These values are higher than the alpha level of 0.05, thus, the null hypothesis can be accepted.

The z-test results can also prove that the alternative hypothesis can be rejected. The alternative hypothesis stated that "TRT in combination with hearing device use, has no significant impact on the THI scores, and therefore, no effect on tinnitus improvement".

The second sub-aim of this study was to explore themes identified in the 25 items of the THI (Appendix 4). The THI explores different lifestyle areas and daily activities, which may be affected by chronic and bothersome tinnitus (Newman, Jacobson & Sandridge, 1998).

If information regarding the THI's development is used from Newman, Jacobson and Spitzer (1996), then the THI can be sectioned into three distinct themes. These themes included:

- Functional Themes: These are daily activities which are negatively affected by the presence of tinnitus. These include: social activities, for example, going out to dinner with friends and family, job or household responsibilities or reading.
- Emotional Themes: These are emotional responses triggered by the presence of tinnitus. These include feelings such as anger, confusion, frustration, irritability, depression and anxiety.
- Catastrophic Themes: These are severe physical reactions due to the presence of tinnitus. These include feelings of desperation or a perception that tinnitus is a dreadful disease.

The information below shows the THI items and which themes each of the THI items fall into.

Table 11: Functional Theme

THI Item	Yes Response	No Response	Sometimes Response
Because of your Tinnitus is it difficult for you to concentrate? Item 1 on THI	10%	75%	15%
Does the loudness of your Tinnitus make it difficult for you to people? Item 2 on THI	44%	36%	20%
Does your Tinnitus interfere with your ability to enjoy social activities? (such as going out to dinner, to the cinema)? Item 9 on THI	20%	37%	43%
Does your Tinnitus interfere with your job or household responsibilities? Item 13 on THI	31%	37%	32%
Because of your Tinnitus is it difficult for you to read? Item 15 on THI	25%	45%	30%
Do you find it difficult to focus your attention away from your tinnitus and on to other things? Item 18 on THI	57%	20%	23%
Because of your Tinnitus do you often feel tired? Item 20 on the THI	20%	70%	10%
Does your Tinnitus get worse when you are under stress? Item 24 on THI	53%	20%	27%
Because of your tinnitus, do you have trouble falling asleep at night.	25%	42%	33%

Emotional Themes

Table 12: Emotional Themes

Responses	Yes Response	No Response	Sometimes Response
THI Item			
Does your Tinnitus make you angry? Item 3 on THI	20%	48%	32%
Does your Tinnitus make you confused? Item 4 on THI	22%	49%	29%
Do you complain a great deal about your Tinnitus? Item 6 on THI	53%	43%	4%
Because of your Tinnitus do you feel frustrated? Item 10 on THI	40%	30%	30%
Does your Tinnitus make it difficult to enjoy life? Item 12 on THI	35%	43%	22%
Because of your Tinnitus do you find that you are often irritable? Item 14 on THI	43%	33%	24%
Does your Tinnitus make you upset? Item 16 on THI	42%	33%	25%
Do you feel that your Tinnitus has placed stress on your relationships with members of your family and friends? Item 17 on THI	35%	55%	10%
Because of your Tinnitus do you feel depressed? Item 21 on THI	35%	57%	8%
Does your Tinnitus make you feel insecure? Item 25 on THI	33%	52%	15%
Does your Tinnitus make you feel anxious? Item 22 on THI	55%	38%	7%

Catastrophic Themes

Table 13: Catastrophic Themes

Responses	Yes Responses	No Responses	Sometimes Responses
THI Items			
Because of your Tinnitus are you desperate? Item 5 on THI	42%	47%	11%
Do you feel as though you cannot escape your Tinnitus? Item 8 on THI	47%	25%	28%
Because of your Tinnitus do you feel that you have a terrible disease? Item 11 on THI	20%	46%	34%
Do you feel that you have no control over your Tinnitus? Item 19 on THI	44%	40%	16%
Do you feel you can no longer cope with your Tinnitus? Item 23 on THI	25%	43%	32

The following table is a comparison of THI responses (%) obtained from a study conducted by Aksoy, Firat & Alpar (2007) and the current study. The table below can be used to compare results seen in tables 11, 12 and 13 from the current study.

Table 14: THI Results: Askoy, Firat & Alpar (2007)

THI Item	Yes	Sometimes	No
1	42%	35%	24%
2	32%	26%	42%
3	51%	32%	17%
4	39%	22%	39%
5	27%	31%	42%
6	63%	16%	21%
7	43%	31%	26%
8	47%	16%	30%
9	26%	21%	56%
10	25%	23%	50%
11	15%	17%	61%
12	28%	25%	44%
13	15%	24%	70%
14	19%	28%	60%
15	24%	15%	49%
16	71%	21%	10%
17	10%	29%	54%
18	48%	19%	25%
19	51%	36%	31%
20	34%	27%	55%
21	26%	18%	46%
22	46%	11%	18%
23	47%	27%	35%
24	71%	36%	15%
25	19%	19%	58%

The table below shows the themes which evoked the strongest responses from the clients:

Table 15: Themes Evoking the Strongest Responses

Functional Theme n=29	Emotional Theme n=29	Catastrophic Theme n=29
72%	53%	37%

Discussion of Findings

These results indicated that 72% of clients' daily activities were negatively impacted by the presence of clinically significant tinnitus. This was an important finding, as it shows that audiological treatment is very important in improving tinnitus, as the quality of daily activities is adversely affected by bothersome tinnitus. Additionally, this has implications relating to the audiological treatment of clients, particularly in terms of which other professionals are required as part of the treatment process. By adding the necessary

professionals to the treating team, for example, psychologists, improvements can be made in the treatment provided to clients and thus aiding them in experiencing improvements in their tinnitus.

The results indicate that 53% of clients have emotional responses to the presence of tinnitus. These emotional responses include anger, confusion, frustration, irritability, stress, depression, insecurity and anxiety (Szczepek & Mazurek, 2017). In the current study, clients reported the following emotional responses: depression (35%), as compared to 26% found in the Aksoy, Firat & Alpar (2007) study, insecurity (33%), as compared to 19% found in the Aksoy et al. (2007) study, anxiety (55%), as compared to 46% in the Aksoy et al (2007) study, irritability (43%), as compared to 19% found in the Aksoy et al study, frustration (40%), as compared to the 25% found in the Aksoy et al (2007) research confusion (20%), as compared to the 39% seen in the Aksoy et al (2007) research and finally anger (20%), as compared to the 51% indicated in the Aksoy et al (2007) research. Differences in percentages can be attributed to cultural difference between studies, the current study was based upon a South African sample and the Aksoy et al (2007) study was based upon a much larger Turkish sample. The Turkish version of the THI was used for the Aksoy et al (2007) study.

The implications of these results show the strong emotional responses which are produced by tinnitus. This supports the concept of a multidisciplinary approach to diagnosis and treatment of tinnitus. The audiologist or ENT alone cannot identify the emotional factors relating to tinnitus. This area should be handled by professionals with experience in treating with emotional responses, for example, psychologists. Baguley, Andersson, McFerran & McKenna (2012), note the importance of a multi-disciplinary approach in the treatment of bothersome tinnitus, particularly in the addition of psychologists. Psychologists can make use of behavioural strategies to change or habituate tinnitus and therefore, assisting in the relief of strong emotional factors that exist because of tinnitus (Baguley et al., 2012).

Psychologists may be able to implement cognitive behavioural therapy (CBT), which is a known treatment method for tinnitus (Moller, Langguth & De Ridder, 2010). Moller et al (2010) described CBT as attempting to address negative thoughts or emotional behaviours that results from accompanying tinnitus. Furthermore, CBT, which is a form of counselling,

has been proved to be effective in improving behavioural issues such as anxiety, anger, depression, insecurity and irritability in clients experiencing tinnitus.

Andersson (2006) reported that tinnitus can produce significant psychological responses, such as the responses mentioned previously, and that psychological treatment may be a welcome addition to the audiological treatment provided by an audiologist, for example, referring to a psychologist.

The results indicated that 37% of clients experienced tinnitus in the catastrophic theme. These factors range from experiencing tinnitus as a dreadful illness, to feelings of desperation because of tinnitus, no control over tinnitus and an inability to cope with their tinnitus.

According to the Aksoy, Firat & Alpar (2007) study, 15% of clients did experienced tinnitus as a dreadful illness, whilst 61% sometimes experienced it as a dreadful disease. These findings from the current study was compared to the results obtained by Aksoy et al. In the current study, 20% of clients experienced tinnitus as a dreadful disease and 34% sometimes experienced it as a dreadful disease. It can be noted that the Aksoy et al. (2007) study used a larger sampling population (n=118). Perhaps if the sample size was larger in the current study, the results would have been better corresponding the Aksoy et al. (2007) study. However, a similar trend is seen in that clients do not often experience severe catastrophic themed events, when experiencing tinnitus.

Traditionally, events linked to catastrophic themed events can be treated by medical intervention (Aksoy et al., 2007). However, results both from the current study and the Aksoy et al. (2007) study indicated that the catastrophic theme is not the most affected theme area. This may have implications for how audiologists manage tinnitus clients, as it shows that audiologists should move closer towards treating emotional and functional themes primarily, followed by catastrophic themes, which may relate more to the medical model of treatment.

A South African tinnitus study conducted by Bagwandin (2015), suggested that clients were more concerned with life-threatening diseases, rather than the psychological impact of ear related difficulties. The results indicated the need for a team focused approach to treating tinnitus. Audiologists undergo basic training related to psychological difficulties and phenomena but are not fully qualified counsellors. It is critical for the audiologist to treat the client's tinnitus within the framework of a team setting. The ideal team approach when treating tinnitus would include: The audiologist, the ENT doctors, the psychologist and the client (Baguley, Anderson & McFerran, 2012). The basic team members may decide during the therapeutic process to refer the client to other professionals where necessary. A multidisciplinary team approach to treating tinnitus is thus highly suggested and indicated (Baguley, Anderson & McFerran, 2012).

Wentzel (2016), noted that the use of hearing devices has a significant impact on the quality of life experienced by a client.

Mayes (2010) has indicated that some styles of hearing devices, for example, a behind-the-ear hearing device with an ear mould, can cause tinnitus to seem louder, because of the hearing device occlusion effect. When hearing devices are occluding the ear, the natural sound may come across as muffled and the tinnitus can become louder (Mayes, 2010). It is thus advisable to use a more open fitting hearing device style, for example, a receiver-in-the-canal hearing device. The open fit which is then provided, reduces the hearing device occlusion effect, which will minimize the loudness of the tinnitus.

CHAPTER 5

CONCLUSION

Introduction

This chapter serves to conclude the findings of the study and to provide recommendations based on the results obtained. The chapter will provide a summary of the results, as well as implications of the results and recommendations for future research.

Summary of the Results

The main aim of this research study was to assess the self-perceived changes by client's experiencing tinnitus, in a private practice setting, after receiving consecutive sessions of tinnitus retraining therapy in conjunction with the use of hearing devices. Below follows a summary of the results obtained in the current study.

- Average age of clients seen: 45 years old. 89,65% of these clients presented with a sensorineural hearing loss. 68% of the clients were male and 31% were female. 51,72% of clients presented with a moderate hearing loss. 89,96% of clients experienced a high-pitched, sloping hearing loss. 65,5% of clients received bilateral hearing devices, while 34% of clients were fitted unilaterally. 89% of clients were fitted with receiver-in-the-canal hearing devices.

- Participants experienced benefit from TRT and hearing device use after attending 3 to 6 sessions of consecutive sessions.

- Mean initial THI score was 50,53 (Grade 3 handicap).

- Mean final THI score was 29,3 (Mild handicap).

- A statistical z-test confirmed that there was a statistically significant change in pre-TRT scores and post-TRT scores (P (Z<=z one tail: 8,85 and P (Z<= z two tail: 1,77). This suggests that TRT and hearing device use is an effective treatment method for tinnitus.

- The THI can be divided into three distinct themes, which can guide tinnitus treatment and referrals: a functional theme, emotional theme and a catastrophic theme. The thematic analysis of the 25 THI items indicated that 72% of clients experienced functional disturbances, relating to their daily activities, due to bothersome tinnitus.

- Tinnitus treatment should consist of a multi-disciplinary approach, including audiologists, ENTs and psychologists.

Critical Evaluation of the Study

Strengths of the Study

- This study was the first study based in a South African context, to assess the benefits of using TRT and hearing devices when treating tinnitus. This provides South African audiologists with evidence-based information when treating clients experiencing tinnitus.
- The study explored themes within the THI scale, which can lead to improved clinical decision making and referrals for the treatment of tinnitus.

- The study is the only study in South Africa that has explored the THI in terms of themes and how they affect tinnitus treatment.

Limitations of the Study

- The amount of therapy sessions that the clients attended consecutively. Only 34% of clients attended between 3 to 6 consecutive TRT and hearing device use sessions. This is a limitation, because if clients attend more TRT sessions, more THI score information can be obtained, to measure changes perceived in tinnitus more accurately. Additionally, the results indicated that clients benefitted from attending 3-6 sessions of TRT and hearing device use.
- Sample size used for the study. International studies have used more participants for their tinnitus studies. A higher sample population could make research results more generalizable to the general population and thus more reliable.

- A total of four TRT trained audiologists were called on to participate in the current study. Only 2 audiologists agreed to participate, which was limiting to the study, as it decreased the population of clients receiving TRT from a trained professional. This suggested that the findings of this study could not be generalized to the greater professional community. This low number of post-graduate tinnitus trained audiologists did however indicate the need for a training program for TRT for audiologists based in South Africa.

- No pilot study was conducted, and no control group was implemented during the data collection period. However, it must be noted that the study made use of a non-experimental study design, and thus there was no need to include a pilot study or a control group. These may be included in future TRT and hearing device use research projects.

Recommendations for Future Research

Based on the results obtained, the following recommendations can be suggested in terms of new research opportunities in the field of tinnitus:

- Including more client biographical information, to obtain more rich data.

- Research focusing on the public health care sector, especially focusing on the broader South African context and including cultural and traditional treatment relating to tinnitus.

- Developing a tinnitus training course, like the tinnitus masterclass course, which can be made accessible to South African audiologists.

- Conducting a similar research study within the public health care setting, to assess tinnitus treatment programs offered to public health care clients.

Implications of the Study

- The importance of developing a Gold standard for tinnitus treatment, which is accessible to South African based audiologists.

- The importance of adhering to best practice guidelines in terms of tinnitus treatment, to ensure that tinnitus clients receive the best possible clinical outcomes for their tinnitus.

- The significance of supplying a CPD accredited training course for tinnitus, which is made available to South African based audiologists. The only accredited training courses that are tinnitus specific, occur in Denmark and the UK. This may limit audiologist's ability to provide the best treatment for their clients, as in-depth post graduate training may not be accessible to all. This has some serious implications when discussing evidence-based practice and best practice guidelines. As audiologists registered with the HPCSA, it is important to keep up to date with the latest developments and research relating to treatment options available and to ensure that they are solidly researched.

REFERENCES

Acton, A. (2013). *Tinnitus: New Insights for the Health Care Professional.* Scholarly Editions.

Alcamo, E.I., Begdahl, J. (2003). *Anatomy Colouring Workbook.* Random House, Inc.

Ariizumi Y, Hatanaka A, Kitamura K. (2010). *Clinical Prognostic Factors for Tinnitus Retraining Therapy with a Sound Generator in Tinnitus Clients.* J Med Dent Sci.Mar;57(1):45-53.

Aksoy, S., Firat, Y., Alpar, R. (2007). *The Tinnitus Handicap Inventory: A Study of Validity and Reliability.* International Journal of Tinnitus; Volume 13; number 2; p94-98.

Arts, R., George, E., Stokroos, R., Vermeire, K. (2012). *Review: Cochlear Implants as a Treatment of Tinnitus in Single Sided Deafness. Volume 20, number 5.*

Andersson, G. (1996). *The Role of Optimism in Clients with Tinnitus and in Clients with Hearing Impairment.* Psychology and Health, 11, 697, 707.

Andersson, G. (2002). *Psychological Aspects of Tinnitus and the Application of Cognitive-Behavioural Therapy.* Clinical Psychology Review. Volume 22; Issue 7, September 2002, pg 977-990.

Baguley, D., Andersson, G., McFerran, D. (2012). *Tinnitus: A Multidisciplinary Approach.* John Wiley & Sons.

Baguley, D., Fagelson, M. (2016). *Clinical and Research Perspectives.* Plural Publishing.

Bagwandin, V.V.P. (2015). *Young Adults' Awareness and Experience of Tinnitus: A Survey of a Sample of Students at a University in Kwa-Zulu Natal.*

Bauer, C.A., Brozoski, T.J. (2011*). Effect of Tinnitus Retraining Therapy on the Loudness and Annoyance of Tinnitus: A Controlled Trial.* Mar-Apr;32(2):145-55.

Bartels, H., Staal, M.J., Albers, F.W.J. (2007). *Tinnitus and Neural Plasticity of the Brain.* Otology an Neurotology, 28:178-184.

Berger, E.H. (2003). *The Noise Manual.* American Industrial Hygiene Association.

Berrios, G.E., Ryley, J.R., Garvey, N., Moffat, DA. (1988). *Psychiatric Morbidity in Subjects with Inner Ear Disease.* Clinical Otolaryngology 13 (4): 259-266.

Bernard, H.R., Ryan, G.W. (2010). *Analysing Qualitative Data: Systematic Approach.* SAGE.

Bersnstein Ratner, N. (2006). *Evidence-Based Practice: An Examination of its Ramifications for the Practice of Speech-Language Pathology.* LSHSS, 37: 257-267.

Bluestone, C.D., Simons, J.P., Healy, G.B. (2014). *Bluestone and Stoole's Paediatric Otolaryngology.* PMPH-USA.

Boltyenkow, A. (2014). *A Healthcare Economic Policy for Hearing Impairment.* Springer Gamble.

Bope, T.E., Kellerman, R.D. (2013). *Conn's Current Therapy.* Elselvier Saunders.

Ciminelli, R., Pinto, S., Sanchez, F., Tomita, R. (2010). *Gender and Tinnitus.*

Collins, R.D. (2003). *Algorithmic Diagnosis of Symptoms and Signs: A Cost-Effective Approach; 2nd Edition.* Lippincott Williams and Wilkins.

Davis, A. and E. A. Rafaie (2000). *Epidemiology of tinnitus.* Tinnitus Handbook. R. S. Tyler. San Diego, Ca., Singulair.

Del Bo, L., Ambrosetti, U. (2006). *Hearing Devices for the Treatment of Tinnitus.* Elselvier.

Dias, A., Cordeiro, R. (2008). *Association Between Hearing Loss Level and Degree of Discomfort Introduced by Tinnitus in Workers Exposed to Noise.* Brazilian Journal of Otolaryngology.

Dodd, B. (2007). *Evidence Based Practice and Speech-Language Pathology: Strengths, Opportunities and Threats.* Folia Phoniatrica et Logopaedica, 59: 118-129.

Dillon, H. (2012). *Hearing Aids* (2nd ed.). New York: Thieme Medical Publishers.

Eggermont, J.J. (2007). *Pathophysiology of Tinnitus.* Progress in Brain Research. Elsevier.

Eggermont, J.J., Zeng, F.G., Popper, A.N., Fay, R.R. (2012). *Tinnitus.* Springer.

Evered, D., Lawrenson, G. (2009). *Tinnitus.* Pitman Books.

Feldman, H. (1971). *Homolateral and Contralateral masking of Tinnitus by Noise Bands and By Pure Tones.* Audiology 10: 138-144.

Costanzo S, Crocetti A, Pignataro L, Del Bo L, Ambrosetti U. (2009). *Are Results of Tinnitus Retraining Therapy Maintained Over Time? 18-Month Follow-up After Completion of Therapy.* Audiol Neurootol. 2009;14(5):286-9. Epub 2009 Apr 15.

Folmer, R.L., Griest, S.E. (2003). *Chronic Tinnitus Resulting from Head or Neck Injury.* Laryngoscope, May 113 (5): 821-827.

Folmer, R.L., Carrol, J.R. (2006). *Long-Term Effectiveness of Ear-Level Devices for Tinnitus.* Mosby.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 24.

hass.co.za/tinnitus/

Henry, J. A., K. C. Dennis, et al. (2005). *"General review of tinnitus: prevalence, mechanisms, effects, and management."* J Speech Lang Hear Res 48(5): 1204-1235.

Henry, J.A., Schechter, M.A., Nagler, S.M., Fausti, S.A. (2002). *Comparison of Tinnitus Making and Tinnitus Retraining Therapy.* Journal of the American Academy of Audiology, 13, (10).

Ito M, Soma K, Ando R. (2009). *Association Between Tinnitus Retraining Therapy and a Tinnitus Control Instrument.* Auris Nasus Larynx. Oct;36(5):536-40. Epub Mar 6.

Jasterboff, P.J., Jasterboff, M.M. (2000). *Tinnitus Retraining Therapy: An Update.* Audiology Online. 23 October 2000.

Jasterboff, P., Hazel, J.W.P., (2008). *Tinnitus Retraining Therapy: Implementing a Neurophysiological Model.* Cambridge.

Juhn, S.K., Hunter, B.A., Odland, R.M. (2001). *Blood-Labyrinth Barrier and Fluid Dynamics of the Inner Ear.* International Tinnitus Journal: 7:72-83.

Knig, O., Schaette, R., Kempter, R., Gross, M. (2006). *Course of Hearing loss and Occurrence of Tinnitus.* Hearing Research 221 (1-2): 59-64.

Kochkin S, Tyler R. (2008). *Tinnitus treatment and the effectiveness of hearing aids: hearing care professional perceptions.* Hearing Review.15(13):14-18.

Kroon, H. (2017). *Collaborative Audiological and Psychological Intervention Where Tinnitus and Hearing Loss Co-Exits.* A Masters Dissertation. University of Pretoria.

Lammers, W, J., Badia, P. (2005). *Fundamental of Behavioural Research.* California: Thompson and Wadsworth.

Lavrakas, P.J. (2008). *Encyclopaedia of Survey Research Methods.* SAGE.

Lawrence, BM. (2015). *Tinnitus No More: The Complete Guide on Tinnitus Symptoms, Treatments and Natural Remedies to Get Rid of Ringing in Ears Once and for All.* Enlightened Publishing.

Lorelli, J., Nowel. J.M., Norris, D.E., White, N.J., Moules, J. (2017). *Thematic Analysis: Striving to Meet the Trustworthiness Criteria.*

Matt, V., Matthew, H. (2013). *The Retrospective Chart Review: Important Methodological Considerations.* Journal of Educational Evaluation for Health Care Professionals.

Maxwell, J.A. (2005). *Qualitative Research Design: An Interactive Approach, 2nd Edition.* SAGE Publications.

McFadden, D. (1982). *Tinnitus: Facts, Theories, Mechanisms.* Ciba Found Sib: 85:1-306.

McNeill, C., Tavora-Vieira, D., Alnafjan, F., Searchfield, D., Welch, D. (2014). *Tinnitus Pitch, Masking, and the Effectiveness of Hearing Devices for Tinnitus Therapy.* International Journal of Audiology 2012; 51: 914–919.

Mayes, J.L. (2010). *Tinnitus Treatment Toolbox: A Guide for People with Ear Noise.*

Marshall, C., Rossman, G. (2011). *Designing Qualitative Research.* SAGE.

McKenna, L., Baguley, D.M., McFerran, D.J. (2010). *Living with Tinnitus and Hyperacusis.*

Moller, A.R., Langguth, B., DeRidder, D. (2010). *Textbook of Tinnitus.* Springer.

Moller, A.R., Langguth, B., Hajak, G. (2007). *Tinnitus: Pathophysiology and Treatment.*

Moroe, N.F., Khoza-Shangase, K. (2014). *The Impact of Tinnitus on Daily Activities on Adult Tinnitus Sufferers.* South African Journal of Communication Disorders. Volume 6.

Negrila- Mezei, A., Enache, R., Sarafonleanu, C. (2011). *Tinnitus in the Elderly Population.* PubMed.

Newman, C.W., Jacobson, G.P., Spitzer, J.B. (1996). *Development of the Tinnitus Handicap Inventory.* Arch Otolaryngol Head Neck Surg: 122: 143-148.

Newman, C.W., Jacobson, G.P., Sandridge, S.A. (1998). *Psychometric Adequacy of the Tinnitus Handicap Inventory (THI) for Evaluating Treatment Outcome.* Journal of the American Academy of Audiology, Volume 9, Number 2: 153-160.

Nick, T.G. (2007). *Descriptive Statistics. Topics in Biostatistics.* Methods in Molecular Biology. 404:33-52.

Pablo, E.S., McDonald, B.D. (2005). *Statistics for Research: Applications in Research, Thesis and Dissertation Writing and Statistical Data Management Using SPSS Software.* REX Book Store.

Phillips J.S., McFerran D. (2010). *Tinnitus Retraining Therapy (TRT) for Tinnitus.* Cochrane Database Syst Rev. 2010 Mar 17;(3):CD007330.

Roeser, R.J., Valente, M., Hosford-Dunn, H. (2007). *Audiology: Diagnosis. Volume 1.* Thieme Publishers.

Ravitch, S.M., M. Riggor. (2016). *Reason and Rigor: How Conceptual Framework Guides Research.* SAGE Publications.

Sambra, R., Dambra, C., Lobrinas, E., Stocking, C., Salvi, R. (2008). *Head, Neck & Eye Movements that Modulate Tinnitus.* Seminars in Hearing. 29 (4): 361-370.

Schaub, A. (2011). *Digital Hearing Aids.* Thieme. New York.

Schechter, A., Martin, A., Henry James, A. (2002). *Assessment and Treatment of Tinnitus Clients Using a Masking Approach.* Journal of the American Academy of Audiology, Volume 13, Number 10, November 2002, pp. 545-558(14).

Schaette, R., Kempter, R. (2006). *Development of Tinnitus-Related Neuronal Hyperactivity through Homeostatic Plasticity after Hearing Loss: A Conceptual Model.*

Shrivastav, R.P. (2014). *An Illustrated Textbook: Ear, Nose and Throat and Head and Neck Surgery.* Jaypee Brothers Medical Publishers.

Sim, J., Wright, C. (2000). *Research in Health Care: Concepts, Desings and Methods.*

Snow, J.B. (2004). *Tinnitus: Theory and Management.*

Szczepek, A., Mazurek, B. (2017). *Tinnitus and Stress: An Interdisciplinary Companion for Health Care Professionals.* Springer.

Tyler, R. (2011). *Tinnitus Treatment: Clinical Protocols.* Thieme. New York.

Wasserman, L. (2004). *All of Statistics: A Concise Course in Statistical Inference.* Springer.

World Health Organization (WHO). (2008). *International Classification of Functioning: Disability and Health.* WHO.

Wentzel, T. (2016). *The Relationship Between Practical Hearing Aid Skills and Client Satisfaction in the Public Health Care Setting.*

Willems, P.J. (2003). *Genetic Hearing Loss.* Marcel Dekker, Inc.

https://www.widex.pro/en/products/tinnitus-solutions)

Yang H, Zheng Y, Zhang Z, Lan J, Chen S, Liang X, Chen L. (2010). *Analysis and Comparison of the Masking and TRT for clients with Subjective Tinnitus.* PubMed.

APPENDIX 1: Client Information Sheet

Information Document

Researcher: Duone Swart, audiologist.

Good day,

I, Duone Swart, am conducting research to obtain information regarding the success of tinnitus treatment methods, namely Tinnitus retraining therapy and hearing device use. Tinnitus retraining therapy uses counselling to improve tinnitus heard by Clients. Hearing devices are electronic devices which are used to provide amplification for hearing loss. Tinnitus is described as a noise heard by a Client, which is not perceived by other listeners. There is little research available for the success of tinnitus treatment in a South African population. This research will thus aim at collecting data which will assist audiologists in understanding how well certain treatments will help in improving tinnitus for Clients. I am inviting you to participate in this research study to assist me in obtaining answers for the following research study: **"HEARING DEVICE USE AND TINNITUS RETRAINING THERAPY FOR CLIENTS WITH TINNITUS: ASSESSING THE BENEFITS IN A PRIVATE PRACTICE IN JOHANNESBURG, SOUTH AFRICA**

What is involved in the study?

This study will involve a questionnaire being completed by you, as well as three consecutive therapy sessions that will assist you in managing your tinnitus. The questionnaire will take approximately 15 minutes to be completed if you decide on participating in the study. The questionnaire will be given to you at the research site to complete and will be returned to me after completion.

Risks

This research study does not present any risks for you, should you decide to be involved in the study, as your identity will not be disclosed at any point in the research study. All efforts will be made to keep information confidential. The questionnaires are completely anonymous and will be kept in safe keeping by me always during the research process. Should any medical issues be suspected as a cause for your tinnitus, you will be referred to an ear, nose and throat specialist (ENT) for further evaluation.

Contact details of the researcher:

For any further queries, please feel free to contact me, Duone Swart, at the following contact details:

swartduone3@gmail.com

_____

Duone Swart

Researcher

Speech therapist and Audiologist

_____

Mrs Liepollo Ntlhakana Research Supervisor/Clinical tutor (Audiology)

Liepollo.Ntlhakana@wits.ac.za

APPENDIX 2: Client/Audiologist Consent Form

Client Number: _____

Consent Form: _____

I hereby consent to participate in the research project. The purpose and procedures of the study have been explained to me. I understand that my participation is voluntary and that I may refuse to answer any items or withdraw from the study at any time without any negative consequences. I understand my responses will be kept confidential.

Name of participant: _____

Date: _____

Signature: _____

I have explained the purpose and procedures of the research study as well as the rights of the research participants. I agree with the conditions mentioned in the information sheet and consent form/s and undertake to adhere to them.

Name of researcher: _____

Date: _____

Signature: _____

APPENDIX 3: Tinnitus Retraining Therapy Protocol

Tinnitus retraining therapy (TRT) is a treatment protocol used by audiologists to identify, treat and manage various types of tinnitus with which clients may present with. TRT consists of a variety of steps which an audiologist must complete with a client, to ensure that the client's tinnitus can improve. The correct protocol for TRT was explained by Jasterboff and Hazel (2008):
1). **Evaluation**: Used to determine the extent of the tinnitus problem and explores three specific areas: Hearing sensitivity, Reaction to tinnitus and sound tolerance.
The Evaluation must include:
Detailed case history information.

Tinnitus loudness and pitch matching procedures.

2). **Consultation:** The consultation is used to discuss test results with the clients. It consists of a review of:
Objective measurements: Hearing assessments.

Subjective measurements: Review or discussion of the significance of the questionnaires and handicap inventories.

Counselling.

3). **Recommendations:** During this section, all the information gathered is developed into a individualized therapy plan. Recommendations should include:
• Instructional/cognitive counselling.
• Sound therapy.
• Lifestyle recommendations.
• Follow up schedule.

Treatment Components:
Counselling:

- • Instructional Counselling portion: Explain ear anatomy and how tinnitus occurs.
- • Cognitive counselling portion: How their thinking and reaction affects tinnitus.

- Sound therapy:
- • Generalized (Sound enrichment)
- • Individualized (Instrumentation)

- Basic Concepts of Sound Therapy:
- • Decrease auditory dark room.
- • Interfere with detection of tinnitus (Distract, Divert, Deflect).
- • De-tune activity in the autonomic auditory system.
- • Create distraction.
- • Provide relaxation.

Sound Therapy Tools: Generalized Acoustic Environmental Enrichment.
• Table top sound generators.
• Sleep pillows.
• Music (iPod, MP3, radio).
• Fans.
• Water fountains.

Appendix 4: Tinnitus Handicap Inventory

TINNITUS HANDICAP INVENTORY

Patient Name: _____ Date: _____

INSTRUCTIONS: The purpose of this questionnaire is to identify difficulties that you may be experiencing because of your tinnitus. Please answer every question. Please do not skip any questions.

1.	Because of your tinnitus, is it difficult for you to concentrate?	Yes	Sometimes	No
2.	Does the loudness of your tinnitus make it difficult for you to hear people?	Yes	Sometimes	No
3.	Does your tinnitus make you angry?	Yes	Sometimes	No
4.	Does your tinnitus make you feel confused?	Yes	Sometimes	No
5.	Because of your tinnitus, do you feel desperate?	Yes	Sometimes	No
6.	Do you complain a great deal about your tinnitus?	Yes	Sometimes	No
7.	Because of your tinnitus, do you have trouble falling to sleep at night?	Yes	Sometimes	No
8.	Do you feel as though you cannot escape your tinnitus?	Yes	Sometimes	No
9.	Does your tinnitus interfere with your ability to enjoy your social activities (such as going out to dinner, to the movies)?	Yes	Sometimes	No
10.	Because of your tinnitus, do you feel frustrated?	Yes	Sometimes	No
11.	Because of your tinnitus, do you feel that you have a terrible disease?	Yes	Sometimes	No
12.	Does your tinnitus make it difficult for you to enjoy life?	Yes	Sometimes	No
13.	Does your tinnitus interfere with your job or household responsibilities?	Yes	Sometimes	No
14.	Because of your tinnitus, do you find that you are often irritable?	Yes	Sometimes	No
15.	Because of your tinnitus, is it difficult for you to read?	Yes	Sometimes	No
16.	Does your tinnitus make you upset?	Yes	Sometimes	No
17.	Do you feel that your tinnitus problem has placed stress on your relationships with members of your family and friends?	Yes	Sometimes	No
18.	Do you find it difficult to focus your attention away from your tinnitus and on other things?	Yes	Sometimes	No
19.	Do you feel that you have no control over your tinnitus?	Yes	Sometimes	No
20.	Because of your tinnitus, do you often feel tired?	Yes	Sometimes	No
21.	Because of your tinnitus, do you feel depressed?	Yes	Sometimes	No
22.	Does your tinnitus make you feel anxious?	Yes	Sometimes	No
23.	Do you feel that you can no longer cope with your tinnitus?	Yes	Sometimes	No
24.	Does your tinnitus get worse when you are under stress?	Yes	Sometimes	No
25.	Does your tinnitus make you feel insecure?	Yes	Sometimes	No

FOR CLINICIAN USE ONLY

Total Per Column						
	x4		x2		x0	
Total Score		+		+		=

Newman, C.W., Jacobson, G.P., Spitzer, J.B. (1996). Development of the Tinnitus Handicap Inventory. Arch Otolaryngol Head Neck Surg, 122, 143-148.

To interpret the score please refer to the Tinnitus Handicap Severity Scale shown on the reverse side.

TINNITUS HANDICAP INVENTORY SEVERITY SCALE

GRADE	SCORE	DESCRIPTION
1	0-16	Slight: Only heard in quiet environment, very easily masked. No interference with sleep or daily activities.
2	18-36	Mild: Easily masked by environmental sounds and easily forgotten with activities. May occasionally interfere with sleep but not daily activities.
3	38-56	Moderate: May be noticed, even in the presence of background or environmental noise, although daily activities may still be performed.
4	58-76	Severe: Almost always heard, rarely, if ever, masked. Leads to disturbed sleep pattern and can interfere with ability to carry out normal daily activities. Quiet activities affected adversely.
5	78-100	Catastrophic: Always heard, disturbed sleep patterns, difficulty with any activity.

[illegible]

[illegible]

Appendix 5: Audiologist Information Sheet

Information Document

Researcher: Duone Swart, audiologist.

Good day,

I, Duone Swart, am conducting research to obtain information regarding the success of tinnitus treatment methods, namely Tinnitus retraining therapy and hearing device use. Tinnitus retraining therapy uses counselling to improve tinnitus heard by Clients. Hearing devices are electronic devices which are used to provide amplification for hearing loss. Tinnitus is described as a noise heard by a Client, which is not perceived by other listeners. There is little research available for the success of tinnitus treatment in a South African population. This research will thus aim at collecting data which will assist audiologists in understanding how well certain treatments will help in improving tinnitus for Clients.

I am inviting you to participate in this research study to assist me in obtaining answers for the following research study: **"HEARING DEVICE USE AND TINNITUS RETRAINING THERAPY FOR CLIENTS WITH TINNITUS: ASSESSING THE BENEFITS IN A PRIVATE PRACTICE IN JOHANNESBURG, SOUTH AFRICA"**

What is involved in the study?

This study will involve you to act as an independent audiologist for this study. The independent audiologist will be responsible for providing participants presenting with hearing loss and tinnitus with TRT and hearing devices. The researcher will explain a TRT protocol that can be used for treatment of these participants. A list of the inclusion criteria for the participants will be provided to you. You will be asked to complete the TRT protocol with the participant as part of your consultations with them and fit them with hearing aids as part of your normal practice protocol. At each consultation, you will be asked to provide the Client with a tinnitus handicap inventory to complete. These will be provided to you by the researcher. The researcher will collect the completed THIs and will provide them to a moderator audiologist who will be responsible for scoring them. Each participant seen, should complete at least 3 THIs if possible. You will also be asked to complete a 10-15-minute self-developed questionnaire regarding tinnitus practices. The researcher will provide you with the self-developed questionnaire. You can complete the questionnaire if you decide to participate and can hand it in to the researcher after completion. At least 15 participants are required for data collection, but should you have more Clients that would like to participate, you are more than welcome to include them. All participant information sheets and consent forms will be provided to you by the researcher. You are asked to please provide each participant with these forms to read and sign before participating in the study.

Risks

The research presents with the risk of causing symptoms relating to tinnitus treatment such as anxiety, depression and where required, referral to an ear, nose and throat specialist.

The questionnaires are completely anonymous and will be kept in safe keeping by me always during the research process. Client names and details will not be revealed during the study.

For any further queries, please feel free to contact me, Duone Swart, at the following contact details:

swartduone3@gmail.com _____
Duone Swart
Researcher
Speech therapist and Audiologist
Mrs Liepollo Ntlhakana- Research Supervisor _____

Appendix 6

Ethics Clearance Certificate

R14/49 «Tit init name»

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M170325

NAME: (Principal Investigator)	Miss Duone Rochelle Swart
DEPARTMENT:	Speech Pathology and Audiology Kind2Hearing, Private Practice
PROJECT TITLE:	Assessing the Benefits of Hearing Device use and Tinnitus Retraining Therapy for Patients Experiencing Tinnitus in a South African Private Practice
DATE CONSIDERED:	31/03/2017
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Liepollo Ntlhakana
APPROVED BY:	Professor P. Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	07/06/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/We fully understand the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. in this case, the study was initially review in March and will therefore be due in the month of March each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES