CHAPTER ONE

This chapter provides an introduction to the history of audiology and the development of audiology training programmes locally and abroad. It investigates the evolution of the profession of audiology and provides an overview of the trend towards a clinical doctorate as a minimum entry-level into the profession of audiology in the United States. The unique challenges of the South African context are discussed.

"We have problems that we must confront. There are those outside of our profession who minimize our value and would, if they could, define for us who we are and what we can and cannot do. However, we are an autonomous profession with noble bloodlines. We alone in our home organizations will chart the course that defines our future."

Gary Jacobson (2002:54)

1. Rationale

The profession of audiology has changed considerably during its relatively brief history (Hood, 1993). Over the past decade, the scope of practice of audiology has grown as a result of technological advances, a better understanding of the complexity of the sense of hearing, and increased sophistication of the tools used to assess it (Van Vliet, Berkey, Marion & Robinson, 1992; Kidd, Cox & Matthies, 2003). In the United States, it has been recognized that the requisite knowledge base underlying the practice of audiology has expanded significantly and as a result there has been a shift from a Masters degree to the Clinical Doctorate in Audiology (Au.D.) as the minimum entry-level into the profession.

In South Africa, the burgeoning field of audiology has also been recognized and the Professional Board for Speech-Language and Hearing Professions (hereafter referred to as the Professional Board) has recognized speech-language therapy and audiology as two separate, independent and autonomous professions (HPCSA, 2005). Tertiary institutions have responded by moving away from the traditional programme that taught speech pathology and audiology (allowing for dual registration with the Health Professions Council of South Africa [HPCSA] as both a speech-language therapist and audiologist) within a four-year undergraduate degree structure. Since 1999, some university departments in South Africa have introduced a split-curriculum and have trained and graduated students as either speech-language therapists or audiologists resulting in registration with the HPCSA on the respective single register. The Universities of Cape Town and KwaZulu-Natal currently train audiology and speech-language therapy students together up to the second year level. Students then move into specific training at a third and final year level. At the University of Pretoria, students may choose to train as speech-language therapists, audiologists or as both. At the

University of Stellenbosch, since 2004, students are trained and graduated only as speech-language therapists, despite receiving basic training in audiology. The training programme at the former Medical University of South Africa (MEDUNSA), now the University of Limpopo, has only recently been established and is currently training students as speech pathologists and audiologist (allowing for dual registration) specifically for the South African context (Jordaan, 2003). In South Africa, there is thus a lack of consistency across different training institutions in terms of the professional preparation provided.

Furthermore, there is also a lack of consistency regarding HPCSA registration. Currently, three registers exist: a single register for audiology, a single register for speech-language therapy and a dual register for speech-language therapy and audiology. Students who graduated with a degree in speech pathology ***and*** hearing therapy (informally referred to as a degree in speech and hearing therapy) are permitted to register on the dual register as speech-language therapists ***and*** audiologists. Students who hold this degree are generally educated as speech-language therapists and have accumulated 200 hours of training in audiology. The separate training programmes (sometimes referred to a split-curriculum programmes) in audiology and speech-language pathology allow registration on a single register, as an audiologist ***or*** speech-language therapist respectively. Students who graduate from an audiology split-curriculum programme have more specific training and generally more clinical experience in audiology. The current registers are ambiguous in that they imply that registration as a speech-language therapist ***and*** audiologist infers the same training and clinical experience as those registered on both single registers, which is clearly not the case. Not only does the situation cause confusion for the public and potential employers, but it also fragments the professional identity of audiologists.

Despite these developments at a national level, the Discipline of Speech-Language Pathology and Audiology at the University of the Witwatersrand has continued to train students as speech and hearing therapists who are able to register with the HPCSA as both speech-language therapists *and* audiologists. The discipline has refrained from restructuring the programme into a split curriculum for two principal reasons. Firstly, the fields of speech–language pathology and audiology are related on a conceptual and a clinical level. Therefore the integrated training approach leads to a holistic theoretical and clinical approach to communication disorders. Secondly, the needs of the South African population need to be taken into account. In 2003, there were only 1279 registered speech-language therapists and audiologists in South Africa to serve a population of over 40 million in which it is estimated that at least 10% have communication impairment (Jordaan, 2003). According to the HPCSA website, there are currently a total of 1762 speech, language and hearing professionals registered with the professional board. The rationale is that a speech and hearing “generalist” may

better serve the needs of South Africa than speech-language therapists or audiology "specialists". The discipline of audiology, in particular, is at a crossroads in that the level of expertise that can be acquired by the "speech and hearing therapy" student is limited by the sheer volume of knowledge that is required and by the restricted amount of time available for clinical training in both speech-language pathology and audiology over 4 years. Simply put, it seems that too much content may be covered in too short a time. The result could be dilution of course content and inadequate clinical training experience (Margolis & Jirsa, 1996). A decision needs to be made regarding how best to train future audiologists to serve the South African population.

At the heart of the quandary regarding training is an ethical dilemma between serving the needs of the South African population and being able to offer communicatively impaired individuals specialized services and audiologists international mobility. There are two major schools of thought in biomedical ethics that capture the dilemma: deontology and consequentialism (Beauchamp & Childress, 1989). Deontology places value on the individual and from a deontological perspective, training should provide the expertise that any communicatively impaired person may require. In a sense then, deontology promotes best practice. Consequentialism holds that what is best is what would provide the "greatest good for the greatest number" of people (Beauchamp & Childress, 1989: 26). In a developing country such as South Africa, with limited resources and a culturally and linguistically diverse population, a generalist who could serve vast number of people with communication disorders may be more relevant and cost-effective (Beauchamp & Childress, 1989).

The fact that South Africa is currently the only country on the continent of Africa to train speech-language therapists and audiologists is important in that the country has a significant role to play in training professionals for other African contexts. Speech Pathology and Audiology courses have been initiated in Ethiopia and Uganda, but have yet to graduate students (Louw, 2007)

1.1. The Evolution of Audiology

In its most basic form, audiology can be regarded as the science or study of hearing (Katz, 2002; Roeser, Valente & Hosford-Dunn, 2000). The term *audiology* is a combination of the Latin word "*audire"*, to hear, and the Greek word "*logia",* meaning the science or theory of (Webster's Unabridged Dictionary 1997 cited in Kidd, Cox & Matthies, 2003). Clinical audiology involves studying hearing as part of the human communication system (Kidd, Cox & Matthies, 2003).

According to the Professional Board (2005), an internationally accepted definition of an audiologist is: "A heath care and educational professional who assists in the promotion of normal communication as well as the prevention, identification, assessment, diagnosis, treatment and management of the

following disorders in a variety of settings ranging from private practice, private hospitals, government hospitals, rural clinics, tertiary institutions, schools, pre-schools, industries, communities and home environments:

- Types and degrees of hearing or balance disorders that arise in the peripheral and/or central auditory or vestibular systems;
- Functional hearing disorders;
- Central auditory processing disorders
- Developmental or acquired disorders of language and language processing caused by a hearing loss…, involving the subcomponents: phonology, morphology, syntax, semantics and pragmatics and the modalities concerned with oral, graphic and /or written modes as well as Sign Language and other manual communication systems;
- Developmental or acquired speech disorders caused by a hearing loss: articulation, phonology, and voice disorders (including respiration, phonation, resonance and disordered prosody)."

(HPCSA Shout, 2005:4)

By virtue of their academic training and clinical experience, audiologists are the primary healthcare professionals involved in the identification, prevention and evaluation of auditory and balance disorders. In addition, audiologists are the single most important resources for non-medical habilitation or rehabilitation of hearing loss (Roeser, Valente & Hosford-Dunn, 2000).

Although the title of audiologist had been used by hearing aid dealers in the United States (Harford, 2000), Berger (as cited in Casey & Monley, 2002) credits Canfield (an otologist) for coining the term audiologist in 1945. Canfield authored "'Audiology, the Science of Hearing: a Developing Professional Specialty", which was published in 1949.

The profession of audiology emerged during World War II due to the need for rehabilitation services for deafened war veterans (Byrne, 1995; Katz, 2002; Casey & Monley, 2002). The rehabilitation services for those who had lost their hearing as a result of noise exposure in the war required specialist input from various fields, including acoustics, psychology and speech pathology. Audiology as a discipline was thus born because the education and clinical skills required of an audiologist crossed multiple disciplines (Burkard, 2002). Norton Canfield and Raymond Carhart used the term "audiologist" to describe the professional services provided to military personnel with hearing loss in an Aural Rehabilitation Centre in a Deshon Army Hospital in Butler, Pennsylvania. Soon the term spread to other military aural rehabilitation centers where similar services were being offered.

Prior to World War II, hearing assessments would have been performed by medical personnel and it has been speculated that the commercial hearing aid dispensers and speech pathologists would have performed rudimentary hearing tests at this time (Byrne, 1995). In the 1940s, hearing aids could reportedly be purchased from department stores, opticians and chemists as well as from the hearing aid firms themselves since there was no legal regulation of trade. By the end of World War II, more than 3000 service personnel had received rehabilitation services. When the war ended, many of the personnel who served in rehabilitation centers returned to civilian life and enrolled as students to study the new discipline which was termed audiology.

A diversity of training was offered in the field of audiology immediately after World War II as the education and clinical abilities required of audiologists crossed multiple disciplines (Burkard, 2002). The growing field of electroacoustics required knowledge of both acoustics and electronics; the speech and language problems of individuals with hearing loss required knowledge of speech-language pathology; social problems associated with hearing loss required education and training in psychology and sociology and the anatomical and physiological bases of hearing loss required knowledge of anatomy and physiology (Burkard, 2002). Audiology is thus multifaceted and relies on knowledge from many other disciplines.

The evaluation of hearing loss was limited in the late 1940's and early 1950s when audiology was in its infancy. At this point in the profession's history, the emphasis was on remediation rather than diagnosis. As a result, it was considered to be both unethical and unnecessary for an audiologist to perform many of the clinical services which are considered as routine practice today. For example, it was considered to be both unnecessary and unethical to perform an otoscopic examination as all patients were referred for audiological evaluation by a medical practitioner. Audiologists did not take earmould impressions as these were taken by hearing aid dealers who would dispense hearing aids (Harford, 2000).

Throughout the 1960's and 1970's, the profession of audiology grew steadily from just a few hundred to more than 5000 (Harford, 2000). The scope of practice of audiology was also growing rapidly with an increasing emphasis on tests and measurement rather than rehabilitation due to technological advances applicable to the profession (Van Vliet, Berkey, Marion & Robinson, 1992). The computer technology upsurge of the 1970's and 80's contributed to the changing face of audiology (Wolf, 1994). The Auditory Brainstem Response (ABR) was gaining popularity at this time as a test for screening infants in the Neonatal Intensive Care Unit (NICU), identifying suspected mass-occupying lesions and documenting demyelinating diseases. The discovery of Oto-Acoustic Emissions (OAEs) in 1978 led to the development of new areas of application for audiologists

(Harford, 2000), including newborn hearing screening and ototoxicity monitoring. The 1980's brought with it the introduction of probe microphone measures as a method of evaluating hearing aids in situ and early attempts at applying digital signal processing to hearing aids (Preves & Curran, 2000).

It is of interest that in the United States, prior to 1978, the American Speech and Hearing Association (ASHA) prohibited the sale of hearing aids by audiologists. Up until this point, audiologists focused on hearing aid selection, orientation and counseling as opposed to the actual sale and fitting (Turner, 1998). Changes in the clinical practice of hearing aids occurred in the early 1970's due to research into new areas such as contralateral routing of signal, open earmoulds, tubing and the design of acoustic filters. In 1978, ASHA was forced by a US Supreme court's decision involving a professional society of engineers, to change its Code of Ethics and allow audiologists to dispense hearing aids. Hearing aid dispensing became routine practice during the 1980's, which dramatically increased the responsibilities and scope of practice of audiologists. Dispensing hearing aids also made it financially viable for audiologists to enter into private practice. Hearing aid dispensing thus had a profound effect on the future education and training of audiologists and continues to be the main source of revenue for audiologists in independent practice.

1.2. The Development of Audiology Training Programs Abroad

The development of audiology training programs and the current position of the profession cannot be appreciated without considering the progression of the related profession of speech-language pathology. Most audiology programmes started as a subsidiary of one or two courses in a speech pathology course (Harford, 2000)

Aron (1991) provides an excellent overview of training programs in speech and hearing therapy. She traces the routes of audiology back to speech pathology, which emerged out of education for the deaf in Europe and America in the 18th and 19th centuries. The developments of Deaf Education in these continents led to the practice of speech correction in the education system and by the late 1920's, university speech clinics were created and various courses in speech pathology materialized. These early courses often emerged from within the departments of psychology, education or speech & drama and as a result, many programs today remain within the Faculty of Arts or Science (Aron, 1991).

The training of the profession in Europe in the 1920's and 30's has a somewhat different origin and orientation. The profession of speech pathology was introduced by phoneticians and medically trained voice experts who had studied normal speech and voice. The profession in Europe thus has a close relationship with the medical fraternity and indeed many speech-language pathologists and

audiologists first complete medical training. As a result, many of the speech-language pathology and audiology courses are at a postgraduate diploma level (Aron, 1991).

In the late 1940's, the first students graduated from American university programmes with a specialty in audiology. The content of these early curriculums was heavily weighted in speech correction and speech science. The courses specific to applied audiology were limited to audiometry and aural rehabilitation, which included lip-reading, auditory training and hearing aids (Harford, 2000).

Most of the audiologists that graduated in the 1950's held a Ph.D. and joined speech pathology faculties at other universities to teach a limited number of courses, develop an audiology curriculum or conduct research on the auditory system. By the end of the 1950's, it became apparent that not all graduates with a Ph.D. wanted to pursue an academic career and that some wanted to be located in a hospital, clinic or rehabilitation center (Harford, 2000).

In 1959, ASHA established the American Board of Examiners in Speech Pathology and Audiology (ABESPA). One of the fundamental missions of ASHA was to ensure that speech and hearing services to the public were of the highest quality. In the 1950's, ASHA awarded two levels of certification to individual audiologists as either "basic" or "advanced". These certifications were based on the speech correctionists' requirements. Basic certification was relatively easy to obtain and required a bachelors degree in speech correction or audiology or both in which case there was dual certification. The advanced certification was more stringent and required a Masters degree, in addition to the successful completion of a one-day written examination and an oral examination by external examiners. In the 1960's, the two levels of certification were collapsed into a single level that required a Masters degree.

Following an expected evolutionary path, audiology developed identifiable specializations, including diagnostic audiology, pediatric audiology, industrial audiology, educational audiology, interoprative monitoring and vestibular assessment and management (Harford, 2000). With the increased scope of practice, came a move towards a professional doctorate in audiology (Au.D.) as the minimal entry level into the profession. David P Goldstein (Ph.D.) spearheaded the move towards a clinical doctorate and was the first chair of the Audiology Foundation of America (AFA) a non-profit organization established in 1989 to promote the professional doctorate (Bloom, 2000) The impetus for change in the professional education of audiologists came from audiologists in private practice who recognized the need for newly graduated audiologists to be more competent in certain areas. In 1991, the American Academy of Audiology published a paper strongly endorsing the concept of an Au.D. as an entry-level degree for the practice of audiology. In 1997, the ASHA Legislative Council

passed a resolution mandating an upgrade in the requirement for certification effective on 01 January 2007 and an Au.D. as the basic requirement for certification effective 01 January 2012 (Harford, 2000).

1.3. A brief history of the Au.D.

The Au.D. is a four-year postgraduate course of full-time study including both academic and practicum components. It is different to the research focused Ph.D. in that it requires a minimum of 12 months full-time supervised clinical practicum (approximately 2000 hours) and at least 75 semester credit hours of graduate level course work (ASHA, 2006).

Discussion regarding the need for a professional doctorate as an entry into the profession began in the early 1970's in the United States with an ASHA Task Force for Science being established in 1978 to tackle the issue. In 1983, ASHA underwrote a study concluding the Masters degree did not provide adequate professional preparation and in 1984, the ASHA Task Force recommended a professional doctorate.

Initially it was suggested that the Au.D. become the entry level degree by 1998. In 1988, the Academy of Dispensing Audiologists sponsored the "Move the Mountain" Education Conference which called for audiology to move to a doctoral level. In 1989 the Audiology Foundation of America (AFA), a non-profit organization was formed with a charge to transform audiology to a doctoral profession. In the period from 1990 to 1992, six independent surveys reported that the majority of audiologists supported the Au.D degree. In 1992, the ASHA Ad Hoc committee on Professional Education recommended the Au.D as the entry level degree to practice setting the year 2001 as the target date for implementation. In 1997, ASHA postponed the transition to a doctoral degree as entry to the year 2012 (Academy of Dispensing Audiologists, 2005).

In the United States, the movement to a doctoral entry–level entry for the clinical practice of audiology has been fraught with controversy between audiologists, non-audiologists, students and associations. The pros and cons of the Au.D have been disputed; the rationale, implementation and outcomes have been debated; and importantly, the wisdom of the decision has been argued over the past 30 odd years.

Proponents of the clinical doctorate of audiology had dual goals in mind. One was to improve the training and technical skills of audiologists while the other was to elevate the profession, giving audiologists the same status and degree of autonomy as dentists and optometrists (Pallarito, 2005). Those in favour of the Au.D. argue that the Masters degree is no longer adequate for the

professional preparation of audiologists. This is relevant considering that the Masters degree became the requirement to practice audiology in 1962. This was before scope of practice in audiology included physiological tests, hearing aid dispensing, vestibular assessment, cochlear implants, intraoperative monitoring, auditory processing evaluation and cerumen management. Over and above the time needed to educate and train competent graduates, proponents of the Au.D also argue that the training model plays an important role in determining autonomy, reimbursement and salaries. The argument here is that a professional clinical doctorate as the entry-level into audiology would enhance the status of audiologists amongst other health care professionals and increase earning capacity.

Those who are not in favour argue that changing the degree structure will not bring immediate autonomy and that it is expensive (Margolis & Jirsa, 1996). Since audiology programmes generally have small numbers of students, it may not be viable to spread resources thinly across universities as this would make it difficult to maintain programme quality. A critical issue is the availability of qualified faculty to deliver the new doctoral programs. It seems that experts from various fields will need to teach specific courses and hence education and training from other disciplines should be encouraged. Burkard (2002) makes the point that no medical school exclusively hires MDs to teach medical students and yet audiologists received most of their education and clinical training from audiologists (Burkard, 2002).

The Au.D. is also controversial in that many have voiced concern that if the clinical doctorate is the preferred degree, it may impact negatively on the number of students that take the PhD route (Burkard, 2002; Jacobson, 2000). This would have negative ramifications in terms of ongoing audiological research and the development of the profession.

There is however, a developing trend towards the clinical doctorate as entry level qualification in other professions. In 1985 the expectation of a professional doctorate in physiotherapy (D.P.T.) was proposed and by 2000, the American Physical Therapy Association had published in their vision statement the expectation that the doctoral degree would be the entry level requirement into the profession by 2020. There are currently five accredited doctor of occupational therapy degrees, suggesting the occupational therapy will follow the trend.

It is the author's experience that many any audiologists are of the opinion that four years of undergraduate training followed by 2 years of graduate training represents an educational model that is well suited to the professional training of competent audiologists. The primary problem is that the vast majority of education is received in the final two years. The undergraduate degree should thus

be restructured so that much of the coursework undertaken at a Masters level is received in the final two years of the undergraduate training programme.

Interestingly, surveys by the American Foundation of Audiology (2001) and Academy of Dispensing Audiologists (2002) indicate that the Au.D. has had a beneficial effect for audiologists. Amongst the benefits cited include increased knowledge, greater earning potential and enhanced status with patients and colleagues (Heide, 2002).

1.4. The Development of Audiology Training Programs in South Africa

The training of the profession of audiology in South Africa has its origins at the University of the Witwatersrand, where a phonetician by the name of Pierre de Villiers Pienaar established the Speech, Voice and Hearing Clinic in 1936 (Aron, 1991). The training of speech therapists began as a 2-year diploma in Logopaedics in 1937. The diploma was extended to a 3-year course in 1942 and was converted into a 4-year degree in 1946. These first courses at the University of the Witwatersrand were structured around the interdependency of the hearing, speech and language systems for communication. The anatomy of the ear, hearing process and basic audiometric assessment were taught as part of the speech science course and aural rehabilitation was included in the program when it was converted to the 4-year degree. The approach of combining speech and hearing has formed the core of programs in South Africa (Aron, 1991).

Professor Pienaar left the University of the Witwatersrand in 1957 and introduced a similar 4-year degree at the University of Pretoria in 1959. A 4-year Logopaedics degree was offered at the former University of Durban-Westville from 1973 to 1976. This ceased temporarily and reemerged in 1981 as a Bachelor of Speech and Hearing Therapy in the Faculty of Health Sciences. A 4-year degree in Logopaedics was instituted in the Faculty of Medicine at the University of Cape Town in 1975. The University of Stellenbosch commenced a 4-year degree in Bachelor of Speech Therapy and Audiology in 1989 in the Faculty of Medicine (Aron, 1991). A Communication disorders program was established at the former Medical University of South Africa (MEDUNSA) in 1996 (Weddington, Mogotlane and Thsule, 2003).

The Professional Board for Speech Language and Hearing Professions now recognizes speech-language therapy and audiology as two separate, independent and autonomous professions and to this end have developed a specific scope of practice for each of these professions with minimum competencies and requirements for new qualified graduates (HPCSA Shout, 2005). Two recent professional developments instituted by the Professional Board for Speech Language and Hearing Professions of the HPCSA have endorsed national recognition of the fact the two are two distinct,

albeit related professions. The HPCSA released a final competency profile for new graduates of Speech-Language Therapy and Audiology in August 2005. The document outlines the scope of practice for each profession in terms of client base and professional functions. The expanding and very different scopes of practice outlined for each profession negate the possibility of offering a single qualification that permits dual registration if the competencies are to be achieved.

The introduction of Continuing Professional Development (CPD) by the HPCSA (effective on 01 January 2007) may also have the effect of professionals choosing to follow either speech-language pathology or audiology rather maintaining continuing education units in both fields (HPCSA, 2006).

The current four-year training programmes, as reflected in table 1, do not take into account the fact that vastly different training programmes allow graduates to register with the HPCSA as an audiologist. For example, graduates who hold a Bachelor of Arts (Speech and Hearing Therapy) from the University of the Witwatersrand and graduates who hold a Bachelor of Communication Pathology (Audiology) from the University of KwaZulu-Natal are both eligible for registration as an "audiologist", although their practical training varies considerably. Furthermore, the Universities of the Witwatersrand and Stellenbosch both use the degree title of "speech and hearing therapy", yet graduates from the University of the Witwatersrand are eligible for registration as audiologists and speech therapists, while graduates from the University of Stellenbosch are only eligible for registration as speech therapists. The author would argue that the lack of discrimination between degrees in terms of academic teaching in audiology and clinical training is misleading. Educational reform is clearly central to resolving this issue.

Table 1. Current undergraduate degrees offered by training institutions in South Africa and the relevant registration with the HPCSA. *Source: HPCSA website, 2007.*

Institution	Degree	HPCSA Registration
University of Cape Town	Bachelor of Science (Audiology)	Audiologist
University of Cape Town	Bachelor of Science (Speech-Language Pathology)	Speech-Language Therapist
University of Pretoria	Bachelor of Communication Pathology(Audiology)	Audiologist
University of Pretoria	Bachelor of Communication Pathology(Speech-Language Pathology)	Speech-Language Therapist
University of Pretoria	Bachelor of Communication Pathology(Audiology & Speech-Language Pathology)	Audiologist and Speech-Language Therapist
University of KwaZulu-Natal	Bachelor of Communication Pathology(Audiology)	Audiologist
University of Kwazulu-Natal	Bachelor of Communication Pathology(Speech-Language Pathology)	Speech-Language Therapist
University of the Witwatersrand	Bachelor of Arts in Speech and Hearing Therapy	Audiologist and Speech-Language Therapist
University of Stellenbosch	Bachelor of Speech Language and Hearing Therapy	Speech-Language Therapist
University of Limpopo (MEDUNSA)	Bachelor of Speech Pathology and Audiology	Audiologist and Speech-Language Therapist

1.5. The Quest for Autonomy

It has been stated that “the rite of passage of any profession is to establish autonomy” (Lubinski & Frattali, 1993:59 cited in Lall, Klein & Brown, 2003). The quest for autonomy is not exclusive to the profession of audiology as many of the obstacles and issues faced by audiologists are comparable to those confronted by other professions (Spankovich, 2003). Other professions that have confronted autonomy issues include physicians, occupational therapists, physiotherapists, optometrists, podiatrists and dentists (Spankovich, 2003).

The dictionary defines autonomy as “independence” or “self-governance” (Merriam-Webster Online Dictionary, 2003). The independence associated with professional autonomy is rooted in “dependence” on knowledge and competence of that profession (Spankovich, 2003). To establish autonomy, a “professional authority” must be established signifying status, quality and exude an aura of trust and legitimacy. To establish professional authority, resolution of at least two problems must be accomplished. The first problem, consensus, is an internal factor indicative of concord among members of that profession in regard to goals and objectives (Spankovich, 2003). Educational institutions have an important role to play in terms of creating consensus in terms of the title of the degree and streamlining the training so that all professionals who call themselves “audiologists’ have the same minimal competencies. The second problem, legitimacy, is an external factor and is based on that profession's authority and respect, from previously established professions (Spankovich, 2003). Of importance is appropriate recognition by the government and others for the services it provides.

Audiology, as a profession in South Africa, lacks a clear identity and professional autonomy. Not only is there is a lack of consistency in training programmes across institutions, but there is also a confused perception of our role amongst the public and other professionals (Aron, 1991).

The need for educational reform should be recognized in order to substantiate professional authority, and to better prepare professionals to meet the demands of an expanding science, while providing an enhanced quality of patient care (Spankovich, 2003). This change must have consensus and be adopted by every educational programme. Universal educational reform would create homogeneity among the profession as educational structure determines the ability of a group to produce future practitioners of sufficient quantity and quality (Turner, 1998).

The creation of separated scopes of practice by the Professional Board is clearly a first step towards consensus regarding the fact that audiology and speech therapy are distinct professions. According to the Standards Generating Board (SGB), there is an identified need to allow providers to design

programmes that meet the real needs of different regions in South Africa and as part of transformation the Professional Board is considering a move away from prescribing core subjects other than communication Science and Pathology (Shout, 2005). This suggests that there is not consensus regarding the structure and content of degrees and this time of educational transition lends itself to debate around these issues.

1.6. Scope of Practice of Audiology

Professional academic and clinical preparation in addition to clinical experience is important criteria that define limits within which a profession can operate (Roeser, Valente & Hosford-Dunn, 2000). The boundaries within which a profession can function are defined by the profession's scope of practice. According to Roeser, Valente and Hosford-Dunn (2000) the scope of practice of a profession is determined by government agencies and professional organizations and is used as a reference for issues on service delivery, legislation, consumer education, legal intervention and interprofessional relationships.

The scope of practice must be kept relevant and updated (Bergen, 2003). Changes within the profession (due to emerging clinical, technological and scientific developments), changes in related professions and changes in the larger healthcare arena results in changes to the scope of practice. As a result, it is not uncommon for a profession to extend it's boundaries until challenged legally. When challenged, a profession must be prepared to defend itself with evidence of qualifications and competencies through documentation of adequate academic preparation and experience. Due to the expanding scope of practice of audiology, academic preparation must constantly be evaluated (Roeser, Valente and Hosford-Dunn, 2000).

According to the Professional Board, the following professional tasks should be excluded from the minimum competencies of a newly qualified audiologist:

- the mapping of clients with cochlear implants;
- the management of balance and other vestibular disorders;
- language and speech disorder due to some cause other then hearing loss;
- fluency disorders;
- dysphagia;
- neuromotor disorders;
- voice disorders and
- communicative disorders that require augmentative and alternative communication using high-level technological devices.

Interestingly, the scope of practice makes no mention of cerumen management, which is included in the scope of practice for audiologists in the United States. The minimum competencies laid out by the HPCSA require that newly qualified audiologists have practice management skills.

According to the Standards Generating Body, the proposed four-year qualification exit competencies compares favourably to similar qualification in the United Kingdom, Australia and New Zealand and is thus internationally recognized (HPCSA Shout, 2005). This appears contradictory in that a Masters degree is the minimum entry-level into practice in Australia.

1.7. Challenges Unique to the South African Context

Against the backdrop of the professional developments are the unique challenges faced by the South African context, including:

1. Incongruity of urban and rural services.
2. Disability in relation to the number and distribution of professionals.
3. Linguistic diversity.
4. The HIV/AIDS pandemic.

1.7.1 Incongruity of Urban and Rural Services

The South African healthcare system is characterized by two largely distinct funding and provision arenas. The private health sector is funded mainly via employment-related health insurance schemes, covering around 20% of the population. The balance of the population makes use of a publicly funded hospital and primary care clinic system funded out of general tax revenue (Roberts, 2000; Steinberg, Kinghorn, Söderlund, Schierhout & Conway, 2002).

The Professional Board makes it clear that qualified speech-language and audiology professionals should be able to manage communication disorders within contexts that range from “rural disadvantaged communities to sophisticated, high technology urban service centres”. Graduates are also expected to provide services to persons of all ages within many sectors such as government departments, business, non-governmental organizations and in private practice (HPCSA Shout, 2005:5). Furthermore, professionals are expected to be familiar with sophisticated high-tech equipment, but also able produce materials from locally available matter and low technology resources. In short, graduate of training should be able to provide services that are relevant, appropriate, available and accessible, the pillars underlying the philosophy of primary health care.

The author would argue that while this rhetoric is politically correct and admirable, what it demands from a four-year degree structure is not plausible. The findings of a South African undergraduate study (Johnstone, n.d.) suggest that the multicultural and multilingual population of South Africa is demanding more of speech-language therapists (with a split curriculum qualification) than what they have been trained to do.

1.7.2 Disability In Relation To the Number and Distribution of Professionals

As a developing country, South Africa is experiencing a shortage of health personnel as well as an unequal distribution of services between rural and urban areas. Although the overall shortage of health care professionals affects the private and public sectors, the public sector is more greatly affected by the migration of professionals from the public to the private sector (Leon & Mabope, 2005). This essentially translates into large caseloads for speech therapists and audiologists. The Intergovernmental Fiscal Review (Benatar, 2004) indicates that the national average number of patients served per speech therapist is 172 793 as shown in table 2.

Table 2. Number of persons served by a speech therapist by province in South Africa.

Province	Number served per Speech Therapist
Eastern Cape	950 583
Free State	157 279
Gauteng	79 714
KwaZulu-Natal	170 391
Limpopo	197 418
Mpumalanga	151 681
Northern Cape	244 986
North West	235 777
Western Cape	35 489
National Average	172 793

Source: Intergovernmental Fiscal Review (Benatar, 2004)

The Department of Health has addressed the shortage of health care professionals in the public sector by introducing compulsory community service and a scarce-skills allowance. This has had the effect of placing inexperienced graduates in very challenging work environments. The Pick Report of 2001 advocated the training of mid-level health workers in South Africa as a solution to dealing with staff shortages (Hugo, 2005). While this has proven to be effective in other African countries, it seems untimely to introduce yet another category of qualification into the speech-language and hearing professions. The Professional Board recognizes the need for assistants, but is still working on unit standards for the training of speech therapy assistants. The services that assistants are able to provide will contribute towards audiologists being able to offer more efficient and perhaps more advanced services.

1.7.3. Linguistic Diversity

The caseloads facing speech therapists and audiologists are culturally and linguistically diverse. Many practitioners and educators believe that the lack of cultural and linguistic diversity in undergraduate programmes and practitioners is a serious problem in that it leaves vast segments of the general population underrepresented in audiology (Nemes, 2005). Linguistic diversity, especially, affects audiological management. It may be argued that all health professionals are faced with a language mismatch between themselves and clients, but the nature of communication intervention is necessarily linguistically based. Speech-language therapists and audiologists are thus uniquely affected by the multilingual nature of South Africa.

The most common home language of South Africa is Zulu (24% of the population speak Zulu at home), followed by Xhosa at 18% and Afrikaans at 13%. English is only the fifth most common home language in the country, but is understood in most urban areas and is the dominant language in government and the media (Statistics South Africa, 2003). The majority of South Africans speak a language either from the Sotho branch of Bantu language (including Sestotho, Sesotho sa Leboa and Setswana) or of the Nguni branch (Including Zulu, Xhosa, SiSwati and Ndebele). A language in one of there two groups is understandable to a native speaker of another language in that group. Nguni languages are predominant in coastal areas and the eastern half of the country and Sotho languages are predominant inland. Gauteng is the most linguistically heterogeneous province (Wikipaedia, 2007). Table 3 shows the percentage distribution of languages spoken in South Africa.

Table 3. Percentage distribution of languages spoken in South Africa according to Census 2001 (Statistics South Africa 2003).

Language	Percentage
IsiZulu	23.8
IziXhosa	17.6
Afrikaans	13.3
Sepedi	9.4
Setswana	8.2
English	8.2
Sesotho	7.9
Xitsonga	4.4
SiSwati	2.7
Tshivenda	2.3
IsiNdebele	1.6
Other	0.5

Source: Statistics South Africa (2003)

Two possible solutions to the linguistic dilemma faced in audiology are to recruit students whose linguistic competence is reflective of the demographics of South Africa or to lobby for trained interpreters. This needs to be taken into account when developing the role of potential audiology assistants as well as future audiology curriculums.

1.7.4 The HIV/AID pandemic

HIV is a global pandemic, with approximately 42 million adults infected worldwide. Two thirds of these adults are believed to reside in sub-Saharan Africa and projections suggest that there will be 6 to 7.5 million individuals infected with HIV in South Africa in 2010 (Prasad, Bhojwani, Shenoy & Prasad, 2006).

The HIV/AIDS pandemic is confronting South Africa at a time that its economy has shown growth. Although its GDP per capita positions South Africa as a middle income country, this masks large differences between the rich and poor (Roberts, 2000; Steinberg, Kinghorn, Soderlund, Schierhout & Conway, 2002). South Africa's Gini coefficient, a measure of the difference between rich and poor, is among the highest in the world. Although the HIV/AIDS pandemic affects all sectors of society, poor households in South Africa carry the greatest burden of the disease and have the least reserves available to cope with the disease.

The spread of HIV is closely linked to skill class. Research suggests that semi-skilled and unskilled workers exhibit a peak infection rate nearly three times the rate for highly skilled workers (Arndt & Lewis, 2000). This suggests that while both the private and public sector are likely to be seriously affected, the increased health care burden imposed by the HIV/AIDS pandemic will fall mainly on the public hospital sector.

Audiologists are likely to see an increase in sensorineural hearing loss as a result on the HIV/AIDS pandemic. Research suggests that sensorineural hearing loss, both unilateral and bilateral occurs in 21 to 49% of HIV-infected patients. Most of such patients have had a sensorineural hearing loss that steadily worsens in increasing frequencies, becoming moderate in the higher frequencies. There is currently no evidence to suggest that otitis media is more prevalent in HIV infected populations (Prasad, Bhojwani, Shenoy & Prasad, 2006).

1.8. Conclusion

There are many challenges facing the future of the profession of audiology in South Africa. A mutual study (Naidoo, 2006) was designed to explore some of these challenges and provide insight into the current practice of audiology nationally. Furthermore, the study sought to gain insight into the perceived adequacy of training offered by undergraduate audiology programmes. Given the scope of the study, two separate but related parallel studies were conducted. Naidoo (2006) documented the clinical audiological services offered nationally and investigated

confounding variables. This study examined the perceived adequacy of preparation offered by current audiology programmes and explored opinions regarding the need for educational reform and a future audiology curriculum.

CHAPTER TWO

This chapter details the aims of the study, the research design and the analysis of the data. A detailed description of the sample is also provided.

2. METHODOLOGY

2.1. Objective:

To document a curriculum to train audiologists in South Africa based on:

a. audiologists' perceptions of the adequacy of current undergraduate training programs.
b. audiologists' opinions regarding educational reform in terms of undergraduate and postgraduate courses.

2.2. Sub Aims:

1. To document the perceived adequacy of undergraduate training both theoretically and clinically for audiological service provision.
2. To investigate whether there is consensus amongst graduates regarding the curriculum at undergraduate, postgraduate and additional licensing levels.
3. To explore the opinion of graduates regarding educational reform.
4. To investigate the influences of the following variables on the perceptions of respondents:
    i. University at which respondents obtained their undergraduate degree.
    ii. Year of graduation.
    iii. Registration with the HPCSA
    iv. Qualification
    v. Workplace sector

2.3. Research Design

The mutual exploratory study aimed to provide a portrait of the scope of audiological service delivery in South Africa and to propose a curriculum for training professional audiologists based on the scope of practice reflected by the audit of service delivery and on perceptions regarding the adequacy of current undergraduate training programs. The magnitude of the statistical analysis required to achieve the above objectives necessitated two independent, but parallel studies using a single research tool. This study focused on the perceived adequacy of current undergraduate training programs and curriculum reform in relation to service delivery, while the

parallel study documented audiological service delivery in South Africa and investigated confounding variables.

The methodology involved setting objectives for data collection, preparing a valid and reliable data collection instrument, collecting and analysing the data and reporting on results (Fink, 1995).

A self-administered postal survey (Appendix A) used within a cross-sectional descriptive design was deemed to be the most appropriate methodology for the study from a population representation, data analysis and cost-effectiveness point of view (Bowling, 2002; Neuman, 2006). The study aimed to give a portrait of audiological services and undergraduate training on a national level and aimed to describe, compare and possibly explain knowledge, attitudes and behaviours (Fink, 1995; Struwig & Stead, 2001). A postal questionnaire is regarded as being less of a social encounter than an interview and therefore minimizes social desirability and bias (Bowling 2002). Questionnaires were posted to participants with pre-paid envelopes to increase the response rate.

Qualitative researchers recommend using more than one type of qualitative data to establish validity and reliability (Doehring, 1996; Bowling 2002). However, given the national scale of the survey, the use of interviews and observations to achieve triangulation was deemed to be neither logistically feasible nor cost effective. Furthermore, given the diversity of settings in the South African context, it was felt that implementing limited interviews and observations would provide biased information as many services are contextually driven by extraneous variables.

2.4. Development of the Research Instrument

A self-administered questionnaire was designed to allow correlation between service delivery and the perceived adequacy of undergraduate training programs, in addition to educational reform based on undergraduate and postgraduate courses. This necessitated that sections be identically formatted to support correlations. The majority of questions were closed-ended to facilitate statistical analysis and interpretation. According to Fink (1995), closed-ended questions are more likely to be reliable and consistent over time and do not allow for ambiguous answers. The use of close-ended questions also lent itself to the questionnaire bring formatted for scanning to reduce human error in data capturing. An external company was hired to format and print the questionnaire for scanning so that it looked professional and was visually easy to

read (Bowling, 2002). A representative from Computer Network Services (CNS) at the University of the Witwatersrand was approached to scan the data to disc.

The content of the questionnaire regarding service delivery and the perceived adequacy of undergraduate training programs was derived from academic textbooks (Martin, 1994; Roeser, Valente and Hosford-Dunn, 2000 and Katz, 2002) and the scope of practice of audiology as defined by the American Speech-Language-Hearing Association (ASHA), the American Academy of Audiology (AAA) and the Professional Board of Health Professions Council of South Africa (HPCSA). In addition, a survey by Van Vliet, Berkey, Marion and Robinson (1992) was consulted. The survey revealed that the profession of audiology can be divided into critical skill and knowledge areas including: paediatric audiology, hearing aids, evoked potential testing, industrial audiology, educational audiology, diagnostic assessment, electronystagmography, aural rehabilitation and business/practice management. This list of skills was used as the basis for developing the survey questionnaire.

Given the national scale of the postal survey and the costs involved, it was decided that the questionnaire should be as comprehensive as possible. Although this resulted in an increased questionnaire length, it was deemed to be appropriate given the magnitude of the subject matter and the saliency of the topic to participants. Hoffman et al (cited in Bowling 2002) reported that response rates were similar for a 4-page and 16-page health questionnaire, suggesting that once a questionnaire exceeds 4 pages, length may not have an impact on response rate. Response rates can also vary depending on the sponsorship of the study. The researchers agreed to not mention the name of the sponsoring university to assume a neutral position and reduce the social desirability effect. The researchers refrained from using a web-based questionnaire as this assumed access to a computer and the Internet and had the potential to limit the sample in the South African context.

In an attempt to increase the response rate of the postal survey, copies of the questionnaire were also distributed at local meetings of provincial forums and professional bodies. The webmasters of the SASLHA (South African Association of Speech Language and Hearing Therapists) and SAAA (South African Association of Audiologists) websites were also asked to post a copy of the information sheet (containing the same information as the cover letter) to create awareness of the study. Over and above the researcher providing telephonic contact details, an email address was also set up to allow participants to communicate with the

researchers. It was postulated that some of the potential participants were working overseas and email was deemed to be an easier method of communication for them.

The final questionnaire consisted of 6-pages, arranged into five sections labelled A to E:
Section A: Biographical Information
Section B: Audit of Audiological Services.
Section C: Adequacy of Undergraduate Training
Section D: Future Curriculum Design
Section E: Future Training Programs

Sections A and E were to be completed by all participants, while Sections B, C and D were to be completed by those participants who had clinical experience in audiology since graduation. Sections were labelled so that participants had a clear understanding of which sections they were expected to complete.

2.4.1. Section A: Biographical Information

In order to retain rapport and good will, easy and basic questions were asked first (Fink, 1995; Bowling, 2002). The first section requested biographical information that identified variables for correlation and reflected the representation of the sample. The section was structured to allow the participants to respond without revealing any personally identifiable information in order for confidentiality to be maintained.

The following biographical variables were identified for inclusion:

1. ***Gender***

   Traditionally, the profession of speech and hearing therapy is female dominated. Gender was included in the questionnaire to determine the ratio of males to females.

2. ***Highest academic qualification in audiology***

   The researchers postulated that participants who have postgraduate qualifications may respond differently to those who have undergraduate qualifications based on their knowledge and research experience.

3. Year of graduation

The year of graduation was deemed to be important in terms of curricular changes, the recency effect and the experience of Community Service.

4. Institution of undergraduate training

This was included to ensure that the sample was representative in terms of all the training institutions in South Africa and also to investigate whether perceptions were related to specific training institutions.

5. Institution of postgraduate training

This was included to ensure representation of the sample.

Questions 6 to 8 required the use of unorthodox terminology in order to investigate the understanding of the current position of the profession in South Africa. For all 3 questions, participants were provided with the following choices: “audiologist”, “speech-language therapist”, ‘’speech-language and hearing therapist” and “community speech and hearing worker”. The terms “speech and hearing therapist” and “speech-language therapist and audiologist” are generally used interchangeably. The HPCSA does not recognize the term “speech-language and hearing therapist”, but instead allows registration on a “speech-language therapist and audiologist” register. This is ambiguous as the term “speech-language and hearing therapist” implies a graduate who has training in speech-language therapy who has accumulated 200 hours in audiology, while the term audiologist implies intensive training in audiology comparable to a graduate registered on the single register of audiology.

6. Qualification

Participants were provided with the following choices to describe their qualification: “audiologist”, “speech-language therapist”, ‘’speech-language and hearing therapist” and "community speech and hearing worker”. The names of degrees vary according to institution, for example the University of the Witwatersrand offers a Bachelor of Arts in Speech and Hearing Therapy, while the University of Pretoria offers a Bachelor of Communication Pathology (Audiology). Participants were not restricted to choosing only one item, thus allowing for the choice of “audiologist” *and* “speech-language therapist” rather than “speech and hearing therapist”.

7. Registration with the HPCSA

Participants were provided with the following choices to describe their registration with the HPCSA: “audiologist”,” speech-language therapist”, ‘’speech-language therapist and audiologist”, “community service graduate” and "community speech and hearing worker”. The HPCSA has a register for ‘’audiologists *and* speech-language therapists”, but not for “speech and hearing therapists”. Graduates with a degree in speech and hearing therapy would be eligible to register *both* as an audiologist *and* as a speech-language therapist. Once again, participants were not restricted to a single choice.

8. Practice

Participants were provided with similar choices to describe their current area of practice, but were asked to select only one of the following: “audiologist”,” speech-language therapist”, ‘’speech-language and hearing therapist”, or "community speech and hearing worker”. The restriction to select a single item was based on the underlying premise that it would force participants to identify with a particular profession as opposed to an educational philosophy. That is to say that those participants that consider themselves to be audiologists would not select “speech and hearing therapist”, despite their qualification.

9. Years of employment in current workplace

The above question was included to obtain a sense of how long participants remained in a particular work sector.

10. Primary workplace

This question was asked to establish the variety of work settings available to audiologists in South Africa. It was postulated that the settings available to South African audiologists are fewer than those offered internationally given that audiology is still in its infancy in South Africa.

11. Workplace Sector

Workplace was included in the questionnaire from a curriculum design perspective in order to determine whether the training needs of audiologists working in the private and public sectors differed substantially. The argument to train a dual registration degree

versus a split curriculum degree has often been that the needs of the South African public sector demand a dual registered speech and hearing therapist.

12. Province

Province was included to ensure that the sample was representative of the population and different provincial budgets and needs.

13. Languages confronted in work setting

There is an argument for educational reform in terms of selecting students based on the linguistic needs of the population that the profession serves. This question was asked to provide insight into the range of languages that audiologists (working in various provinces and work settings) are confronted with.

14. Languages in which the participant is able to provide audiological services adequately

The above question relates to establishing the linguistic ability of the sample of audiologists.

Questions 15 to 19 related to the parallel study (Naidoo, 2006).

20. Maintenance of registration on the dual register

Given that Continuing Professional Development has come into effect in 2007, the researchers were interested in finding out whether graduates with a degree allowing dual registration would maintain their status or chose to maintain registration on one register only.

2.4.2. Section B: Audit of Audiological Services.

This section investigated the scope of audiological service delivery in terms of clinical services provided. For Sections B, C and D, the Scope of Practice of Audiology was divided into themes to facilitate analysis and allow correlation between sections. The use of the term “Scope of Practice” is perhaps a little unorthodox in that the areas included are very detailed. In this report, the term “Scope of Practice” was used to delineate those clinical activities that an audiologist might perform on a daily basis as part of a regular work routine.

Table 4 shows the themes identified and provides a classification of the clinical services related to each theme.

Table 4. Themes that clinical services were divided into for the questionnaire.

Theme A	***Basic Audiology***	▪ Pure Tone Audiometry ▪ Speech Reception Testing ▪ Speech Discrimination Testing ▪ Tympanometry ▪ Acoustic Reflexes ▪ Cerumen Management
Theme B	***Diagnostic & Electrophysiological Tests***	▪ Behavioural Site of Lesion Tests ▪ Behavioural Auditory Processing Tests ▪ Otoacoustic Emissions (OAEs) ▪ Auditory Brainstem Response (ABR) ▪ Middle Latency Response (MLR) ▪ Late Latency Response (LLR) ▪ P300 ▪ Mismatch Negativity (MMN) ▪ Auditory Steady State Response (ASSR) ▪ Electrocochleography (ECochG) ▪ Electronystagmography (ENG) ▪ Neurological Intra-Operative Monitoring
Theme C	***Paediatric Audiology***	▪ Behavioural Observation Audiometry (BOA) ▪ Visual Reinforcement Audiometry (VRA) ▪ Play Audiometry ▪ Multifrequency Tympanometry
Theme D	***Amplification***	▪ Real Ear Measures & Insertion Gain ▪ Hearing Aid Selection & Fitting (Adults) ▪ Hearing Aid Selection & Fitting (Children) ▪ Hearing Aid Verification & Validation (Adults) ▪ Hearing Aid Verification & Validation (Children) ▪ Earmould Modifications ▪ Fine Turing Using HI-PRO & NOAH ▪ Fine Tuning Using Manual Trimmers ▪ Bone Anchored Devices ▪ Cochlear Implant Mapping ▪ Auditory Brainstem Implants ▪ Assistive Listening Devices (ALDs)
Theme E	***Hearing Conservation & Prevention***	▪ Implementation of a Neonatal Screening Program ▪ Community Outreach Screening (Adults & Children) ▪ Ototoxicity Monitoring ▪ Industrial Audiology
Theme F	***Habilitation & Rehabilitation***	▪ Auditory Training ▪ Speech Reading ▪ Manual Communication Skills (e.g. Sign Language) ▪ Language Therapy with a Hearing Impaired Child ▪ Cochlear Implant Rehabilitation ▪ Tinnitus Management ▪ Vestibular Rehabilitation ▪ Counselling Related to Psychosocial Impact of Hearing Loss

2.4.3. Section C: Adequacy of Undergraduate Training

This section investigated the perceived adequacy of the current audiology curriculum in audiology in terms of both theoretical and clinical training.

The Likert Scale was employed to assess the attitudes of participants regarding both the theoretical and clinical aspects of the undergraduate curriculum. The Likert Scale contains a series of "opinion" statements about an issue and the person's attitude is recorded as the extent to which he or she agrees with each statement (Bowling, 2002). Although Likert Scales usually work on a 5-point scale, the researcher opted for a 7-point scale in order to make the data continuous rather than ordinal (Fink, 1995, 1 and 8). The advantage of continuous data over ordinal data is the fact that continuous data lends itself to statistical analysis. The seven options that were given include:

1	"Completely Unprepared"
2	"Poorly Prepared"
3	"Somewhat Unprepared"
4	"I Don't Know"
5	"Somewhat Prepared"
6	"Well Prepared"
7	"Completely Prepared".

The use of the statement "I don't know" was included to discourage participants from choosing a neutral statement.

2.4.4. Section D: Future Curriculum Design in terms of Content and Structure.

This section explored participants' opinions regarding what content was essential at an undergraduate level and what content would be more appropriate at a postgraduate level. Further more, there is a move towards additional licensing and the opinions regarding additional licensing were investigated too. Participants were also able to express whether any area should be excluded from the range of activities included in the current scope of practice (HPCSA, 2005).

2.4.5. Section E: Future Training Programs

Participants were required to give their opinions regarding the structure of future audiology training programs in terms of the faculty in which the degree should be placed. There is a public

perception that a Bachelor of Science may be superior to a Bachelor of Arts (despite similar training) and the researcher wanted to investigated whether the sample favoured one faculty over another. This section also investigated whether a research component should be included in an undergraduate degree and what the minimum entry level requirement into the profession should be. This was included to establish whether South African audiologists supported the move towards a higher degree as entry-into the profession in line with the move towards the Au.D. in the United States.

A thank you statement was included at the end of the questionnaire.

2.5. Validity

The questionnaire was piloted on five qualified audiologists working in various settings (private and public) to ensure validity (Bowling, 2002; Hammond, 2000). Two approaches to test validation are appropriate to the questionnaire: content validation and construct validation. Content validity refers to the fit between theory and practice (Hammond, 2000) and was investigated in the form of face validity. Construct validation was measured through assessing the reliability of the questionnaire.

Face validity refers to the judgement that a research tool measures what it purports to measure (Hammond, 2000). To ensure face validity, the researchers needed to be sure that the questionnaire addressed all the necessary areas and did so using the appropriate language (Fink, 1995 -1). The purpose of the pilot study was to confirm the clarity, comprehensiveness and acceptability of the questionnaire (Rea, 1992).

Participants in the pilot study were asked to consider the following:

a. The format of the questionnaire.
b. The size and type of font used.
c. The order of the sections.
d. Omission in terms of content.
e. Inappropriate content.
f. Length of the questionnaire.
g. Approximate time taken to complete the questionnaire.
h. Ambiguity or poorly phrased questions.

Participants were also encouraged to make comments and suggestions which could be written onto the copy of the draft questionnaire supplied.

Since all participants to the questionnaire share a common profession, it was hypothesized that terminology would be familiar and therefore reliability issues would be reduced. The validity of a questionnaire depended on shared assumptions and understanding of the questions and response categories. The purpose of the pilot study was to ensure that the response choices to the questionnaire were sufficiently clear to elicit the desired information and the questions were understood (Rea, 1992). The pilot study also aimed to ensure that the questionnaire was comprehensive and the questionnaire was of an acceptable length.

Results of the pilot study indicated that no changes needed to be made to the content in terms of scope of practice, but editorial changes were made to the questionnaire. A useful suggestion was made regarding the wording of requesting that only participants with clinical experience in audiology answer the service delivery and training sections. Participants in the pilot study reported that given the subject matter, the questionnaire was an appropriate length and that it took approximately 30 minutes to complete.

A covering letter, explaining the aim of the survey and how the participant's details were obtained, was sent with the questionnaire. To ensure that the letter attracted the participant's attention and to prevent the letter being misplaced, it was printed on bright orange paper (Appendix B). The cover letter aimed to increase the response rate (Bowling, 2002) and included the aims of the survey, how names were obtained, and the importance of a response, and why a representative sample was required. In addition, it also ensured confidentiality and explained how results would be used. The name of the sponsoring university was not included given that the researchers wanted the questionnaire to be neutral. An estimation of the time taken to complete the questionnaire was also included in the letter.

Ethical clearance was obtained from the Medical Ethics Committee of the University of the Witwatersrand (Appendix C).

2.6. Sampling

A representative sample was essential to ensure that results could be generalized to the population of audiologists in South Africa and to minimize random error (Fink, 1995 and Litwin, 1995).

The only requirement for participation was that respondents were registered with the HPCSA as a Speech-Language and Hearing professional. A list of all these professionals was obtained from the HPCSA and a total of 1500 questionnaires (based on budget) were sent out using simple random sampling. Simple random sampling implies that the sample is chosen in a manner that affords each sample unit the same chance of being selected (Rosnow & Rosenthal, 1996). It was hoped that the response rate on 1500 questionnaires would allow a large sample, representative of the population of audiologists in South Africa. Stratified sampling was not used based on the assumption that some of the addresses supplied by the HPCSA were incorrect. Incorrect addresses were suspected as there were very few overseas addresses, despite the fact that it is general knowledge that many of the South African graduates are overseas. Given that many graduates are completing their year of compulsory community service, it also seemed likely that many had not changed their address with the HPCSA for that year.

2.7. Data Preparation

The data on the returned questionnaires was “cleaned” and the researchers ensured that the pencil markings were adequately darkened to facilitate screening. The returned questionnaires were scanned at Computer Network Services at the University of the Witwatersrand and raw data was transferred to disc. The scanning system ensured that if more than one choice was made inappropriately or if a question was not answered, the data was then considered to be “missing”. Missing data was not included in the sample and thus sample size varied for themes and sections. It was felt that this was preferable to including means in place of missing data given that the data was not normally distributed.

2.8. Description of the Sample

A total of one thousand five hundred questionnaires (1500) were mailed to practitioners registered with the Board of Speech-Language and Hearing Professionals of the Health Professions Council of South Africa (HPCSA) at the end of March 2005. Reminders were sent through the South African Speech Language and Hearing Association (SASLHA) and the South African Association of Audiologists (SAAA) websites and local and regional state hospital

meetings. Data was collected over April 2005. A total of 284 (18.93%) questionnaires were returned.

The overwhelming majority of respondents (97.17%) were female and only 2.83% male.

Of the 275 respondents that answered question two, the majority (84%) indicated an undergraduate degree, 5.09% a Masters by coursework, 5.82 % a Masters by dissertation and only 2.55 % a research PhD. The remaining 2.55% of respondents held a diploma in Community Speech and Hearing Work. Nine responses unaccounted for. It was interesting to note that the MA coursework and MA by dissertation were almost equally distributed, as an MA by coursework is a relatively new concept in the field.

As indicated in table 5, the sample was representative in terms of the respondents' years of graduation. The majority of participants (31.10%) graduated between 1990 and 1999. Community Service was initiated in 2003.

Table 5. Distribution of respondents according to their year of graduation (*n* = 254).

Period/year of graduation	Number	Percentage
1950 to1959	1	0.39
1960 to 1969	5	1.97
1970 to 1979	30	11.81
1980 to 1989	47	18.50
1990 to 1999	79	31.10
2000	15	5.91
2001	7	2.76
2002	18	7.09
2003	21	8.27
2004	28	11.02
2005	3	1.18

Question 4: ***Institution where undergraduate training was completed (n=282)***

A total of 282 respondents replied to the question regarding the institution where they completed their undergraduate training. Figure 1 shows the distribution of respondents by university of undergraduate degree.

All universities were represented in the survey, with the University of Pretoria having a 45.04% majority. The University of the Witwatersrand had the second largest number of responses at

26.95%, followed by the Universities of Cape Town (10.28%), Kwazulu-Natal (9.93%), Stellenbosch (4.96%) and Limpopo (Medunsa Campus) (0.71%). The remaining 2.13% of respondents selected the category “other”. In this instance, “”other” presumably refers to non-South African institutions.

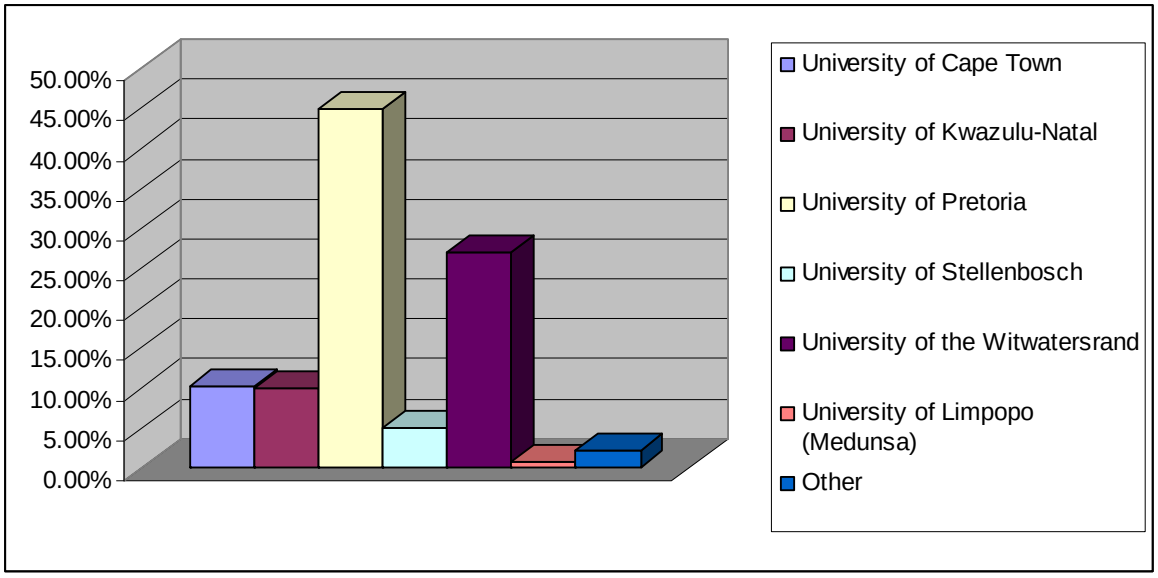

Figure 1. Institution at which undergraduate training was completed (*n* = 282).

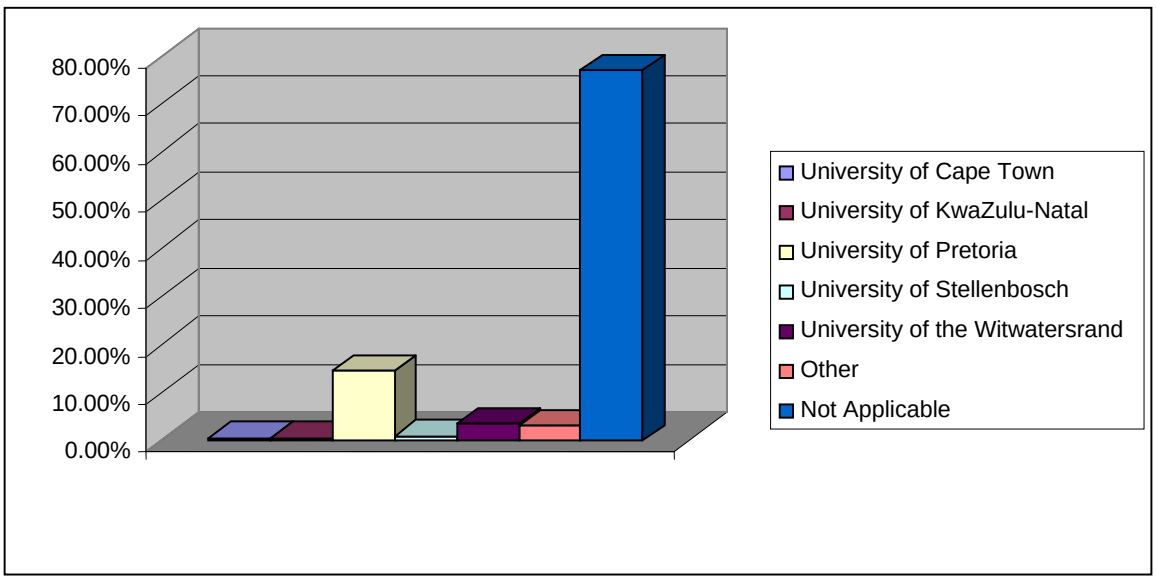

Figure 2. Institution at which postgraduate training was completed (*n* = 199).

Of the 199 respondents that answered question 5 regarding postgraduate training, only 23.12% indicated that they hold a postgraduate qualification. The sample indicated that the majority of

postgraduate degrees (29) were obtained from the University of Pretoria. Seven respondents reported having obtained a postgraduate degree from the University of the Witwatersrand, while two obtained their degree from the University of Stellenbosch. Within the sample, only one person obtained a postgraduate degree from the Universities of Cape Town and only one person obtained a postgraduate degree from the University of KwaZulu-Natal. The remaining six postgraduate degree labeled from "other" institutions are most likely overseas institutions. Figure 2 shows the distribution of respondents in terms of a postgraduate qualification.

Question 6 was poorly answered, perhaps due to the use of deliberate, but confusing terminology. The term "Speech and Hearing Therapist" was coined to denote the four-year professional degree allowing registration on both the register for Speech–Language Therapists and Audiologists. The poor response to this question is reflected in the fact that only 47 respondents replied. Interestingly, 46.81% considered themselves to have qualified as audiologists, 38.3% considered themselves to be qualified as Speech Therapists and only 14.89% considered themselves to be Speech Language and Hearing Therapists. Of particular interest is the fact that participants were not requested to restrict their answer to one choice. The majority of the sample for question 6 thus regards themselves as audiologists.

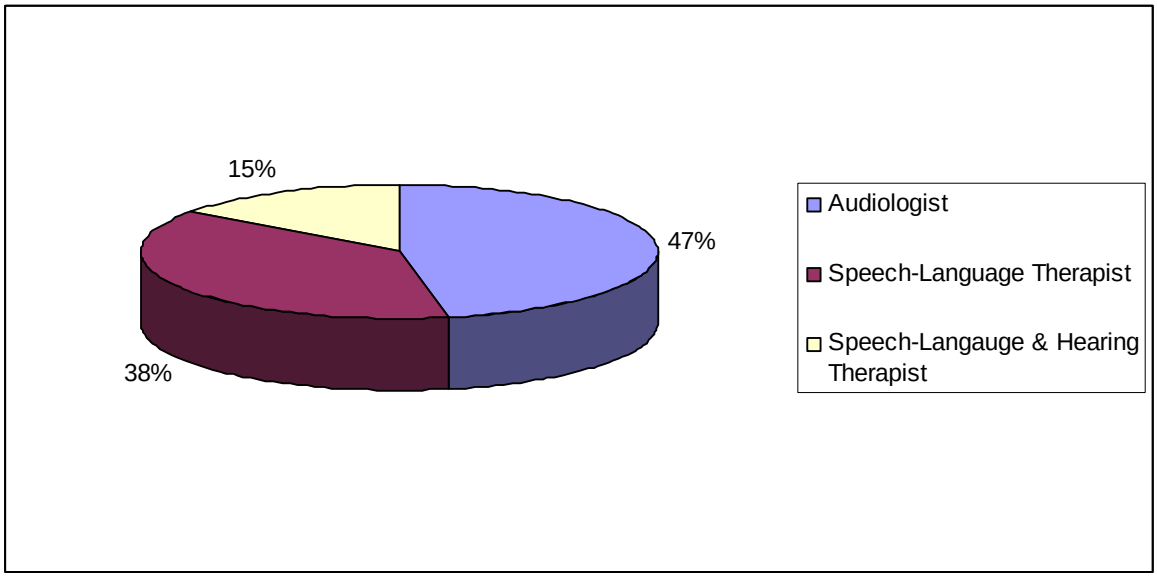

Figure 3. The Nature of Qualification of the Respondents (*n* = 47).

In terms of registration with the Health Professions Council of South Africa, 47% reported being registered as audiologists, 38% reported being registered as Speech Therapists and interestingly 15% reported being registered as Speech Language and Hearing Therapists. This is interesting in that no such category exists on the HPCSA register and respondents were allowed to respond to more than one choice. Only 4% of the sample indicated that they are Community Service Officers, while 2% of the sample is registered as Community Speech and Hearing Workers. The researcher has assumed that the category of dual registration as a speech therapist and audiologist is denoted by category of "speech and hearing therapist".

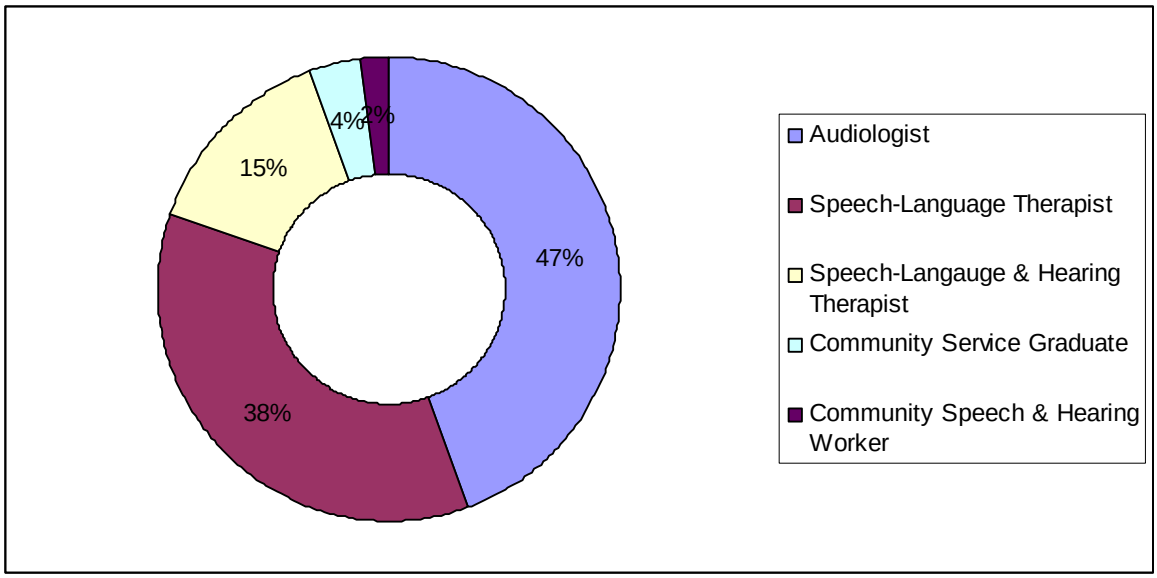

Figure 4. Registration with the Health Professions Council of South Africa (n= 250).

The majority of respondents (42%) indicated that they are practicing as speech-language therapists. 30% indicated that they are practicing as speech language and hearing therapists and 20% indicated that they are practicing as audiologists. 3% percent indicated that they are practicing as Community Speech and Hearing Workers and 5% indicated that they were not practicing the profession.

To summarize, 47% of respondents indicated that they had qualified as audiologists and 47% indicated that they are registered with the HPCSA as audiologists. However, only 20% indicated that they are practicing as audiologists. There is thus incongruence between the number of audiologists registered with the HPCSA and the number of audiologists practicing the profession.

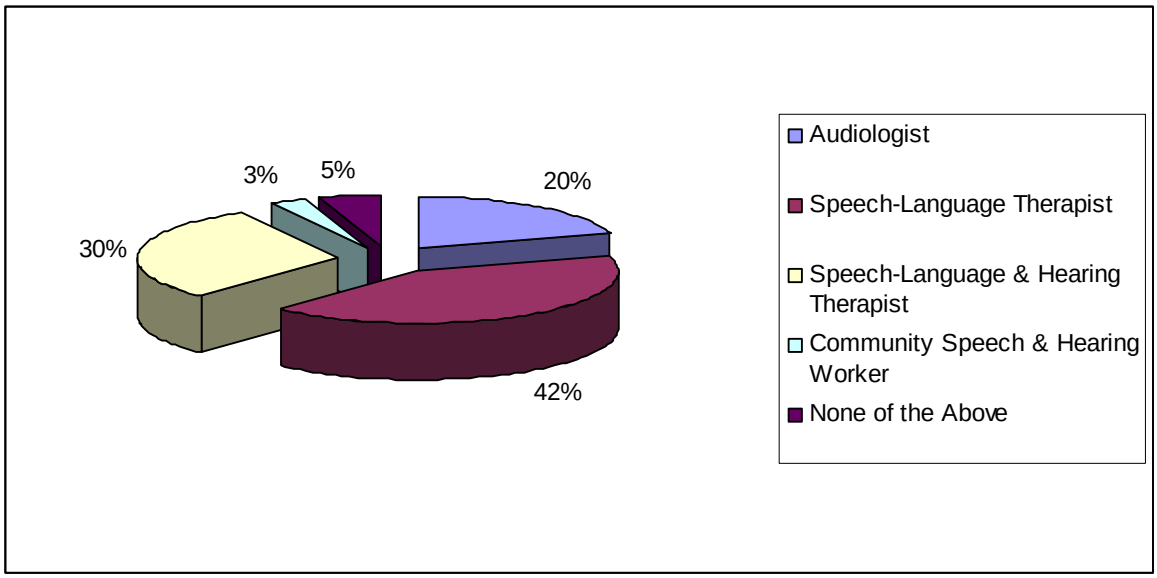

Figure 5. Current occupation of respondents (*n* = 275).

The period of time that respondents had been employed in their current workplace could not be calculated due to the fact that there was too much variability in the manner that the question was answered. With hindsight, the question was poorly constructed and it is regrettable that this was not detected in the pilot study. It would have been more effective to list categories of years rather than ask for a date of employment. This information is excluded from the discussion in the following chapter.

The majority of respondents (38%) reported that they are employed in autonomous private practice. A total of 21% of graduates are employed in state hospitals. As many as 13% of the sample are currently not practicing the profession. A total of 5% working are working in a practice owned or co-owned by an Ear Nose and Throat specialist, 4% are employed in tertiary institutions, 4% work in a district health area or clinic, 2% are employed in hearing aid companies, 1% work in private hospitals and 0.4% are employed by the military. Only 3% reported being employed elsewhere and selected category “other”. A total of 17% of the sample are employed in special schools. It thus seems that the majority of graduates are either employed in an autonomous private practice or in state hospitals. According to question 7, only 10 respondents were community service graduates.

Table 6 and figure 6 show the primary workplace for those respondents that consider themselves to be currently practicing as audiologists.

Table 6. Distribution of respondents practicing as audiologists across primary workplace settings.

Autonomous Private Practice	27
District Health Area/Clinic	2
Hearing Aid Company	5
Not currently practicing the profession	1
Private Hospital	0
Private Practice Owned/Co-Owned by ENT	6
Specialized School	0
State Hospital	10
Tertiary Education Institution	1
The Military	0
Other	2

Source: Naidoo (2006)

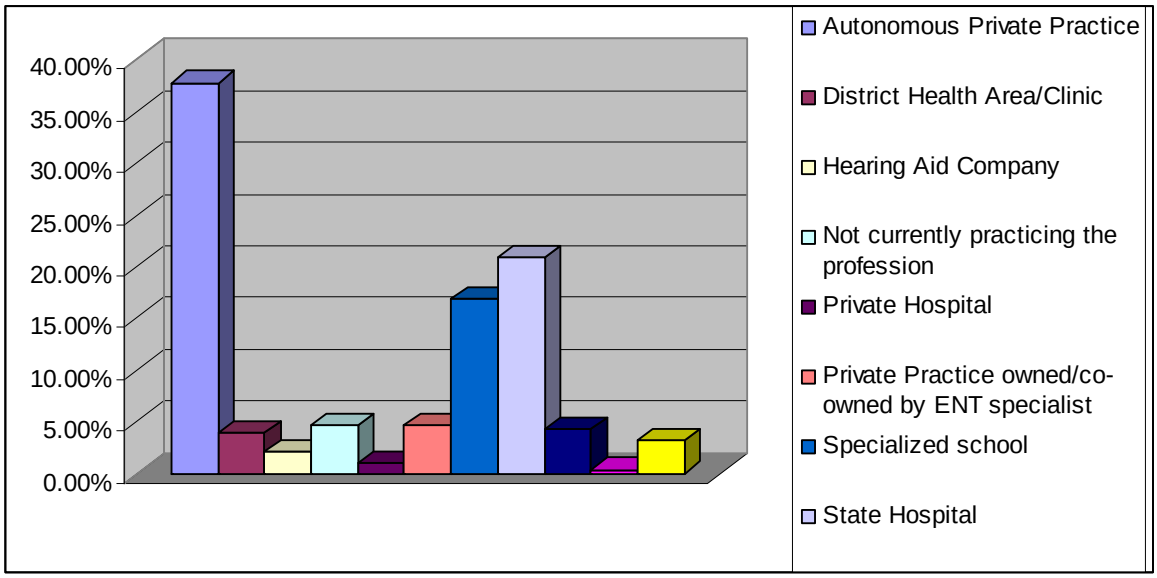

Figure 6. Current workplace of Participants (*n* = 278).

As depicted in table 7, the sample is fairly evenly spread between the public and private employments sectors, with 47.79% indicating that they are employed in the public sector and 52.21% employed in the private sector. This confirms that education needs to prepare graduates for both local relevance and international standards. Interestingly, respondents who indicated that they are currently practicing as audiologists were more likely to be employed in the private sector as indicated in table 8. This may be due to the fact that those audiologists with dual registration who are employed in state hospitals are unable to practice only audiology or

speech therapy, while private practice allows the luxury of choosing one or the other.

Table 7. Primary workplace as a factor of registration with the Health Professions Council of South Africa.

Primary Workplace		Registration with the HPCSA (n=239)				
		Audiologist	Speech-Language Therapist	Speech- Language & Hearing Therapist	Community Service Graduate	Community Speech & Hearing Worker
Public Sector	*n*	10	13	75	10	4
	%	8.93	11.61	66.96	8.93	3.57
Private Sector	*n*	9	15	101	0	2
	%	7.09	11.81	79.53	0	1.57

Table 8. Primary workplace as a factor of the profession that audiologists are currently practicing.

Primary Workplace		Currently practicing as (*n*=264)				
		Audiologist	Speech-Language Therapist	Speech- Language & Hearing Therapist	Community Service Graduate	Community Speech & Hearing Worker
Public Sector	*n*	13	54	48	7	2
	%	10.48	43.55	38.71	5.65	1.61
Private Sector	*n*	41	58	34	2	5
	%	29.29	41.43	24.29	1.43	3.57

As depicted in figure 7, the sample consisted of respondents working in all nine provinces. As expected, the majority of respondents were employed in Gauteng (55.68%). A total of 9.89% of respondents are employed in Kwazulu Natal and the Western Cape respectively. The North West employs 5.86% of respondents. The Eastern Cape and Mpumalanga are the provinces of employment for 5.13% each. Only 3.66% of respondents work in the Free State. Limpopo accounts for 3.3% of the respondents and the Northern Cape accounts for 1.47% of audiologists. There is incongruence in terms of the number of respondents employed in each province and the size of the population in each province.

Table 9. The mid-2007 population estimates for the nine provinces and the distribution of respondents per province (www.southafrica.info/ess_info/sa_glance/demogrpahics/popprov.htm)

Province	Population Estimate	Percentage of Respondents
Eastern Cape	6.9 million (14.4%)	5.13%
Free State	6.2 million (6.2%)	3.66%
Gauteng	9.6 million (20.2%)	55.68%
KwaZulu-Natal	10 million (20.9%)	9.89%
Limpopo	5.4 million (11.3%)	3.3%
Mpumalanga	3.5 million (7.3%)	5.13%
Northern Cape	1.1 million (2.3%)	1.47%%
North West	3.4 million (7.1%)	5.86
Western Cape	4.8 million (10.1%)	9.89%

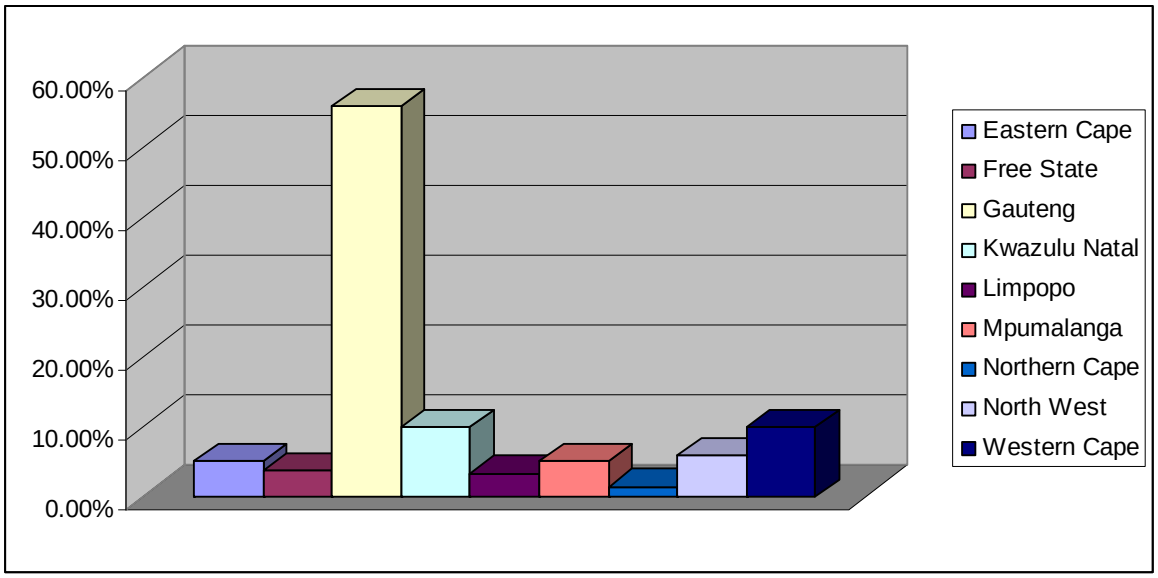

Figure 7. Distribution of Respondents by Province (*n* = 273)

Within the sample of 284 respondents, all official languages were reported to be confronted with in practice. As seen in figure 8, English and Afrikaans are the languages most respondents reported being confronted with. Following that, IsiZulu and IsiXhosa are the other languages most often confronted in everyday practice. Following the trend, the languages in which most respondents reported being able to independently conduct audiological services were English and Afrikaans, followed by IsiZulu and Northern Sotho. The languages in which respondents reported being able to independently conduct services are shown in figure 9.

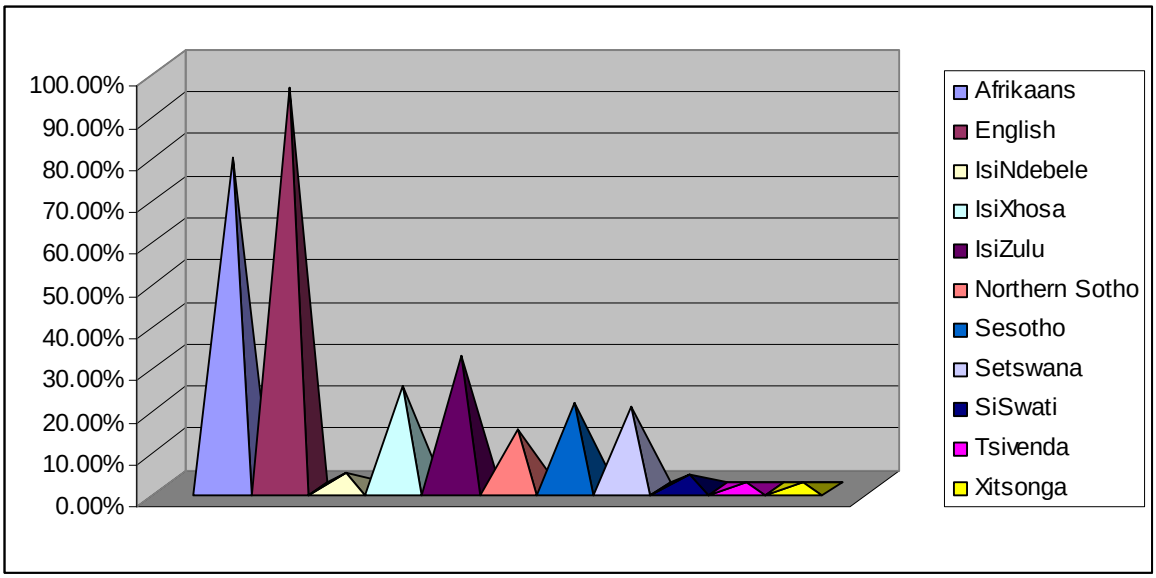

Figure 8. Languages that Respondents are Confronted with in the Workplace Setting (*n* = 284)

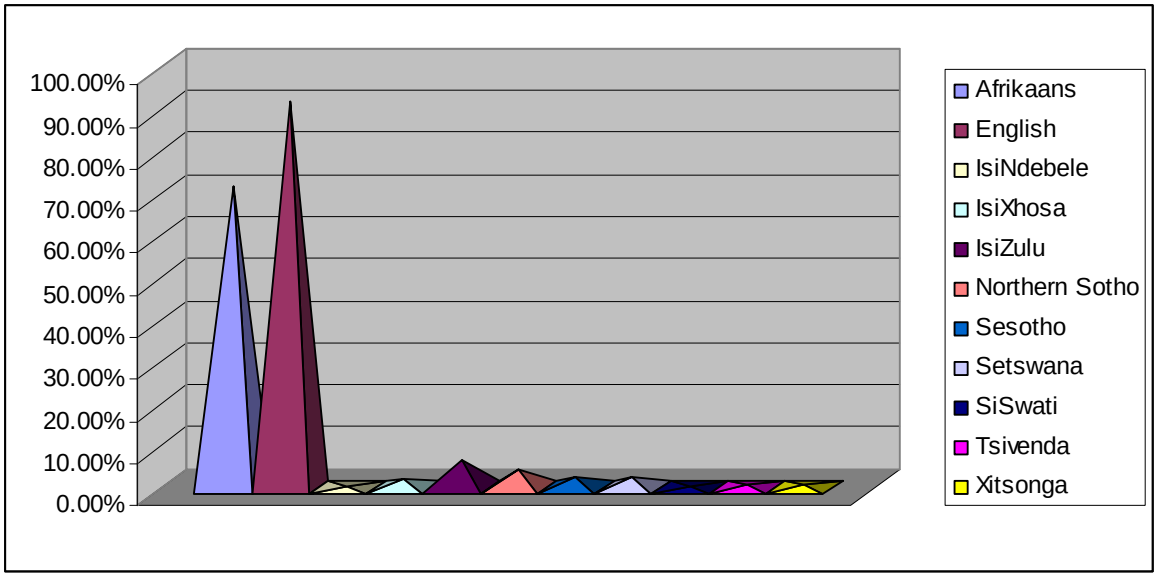

Figure 9. Languages in which Respondents are able to Provide Services independently (*n* = 284)

As shown in figure 10, only 8.49% of the respondents reported having access to trained interpreters, while 38.01% used untrained interpreters. A total of 32.84% reported that they did not have access to interpreters, while 20.66% reported that they did not need the services of an interpreter.

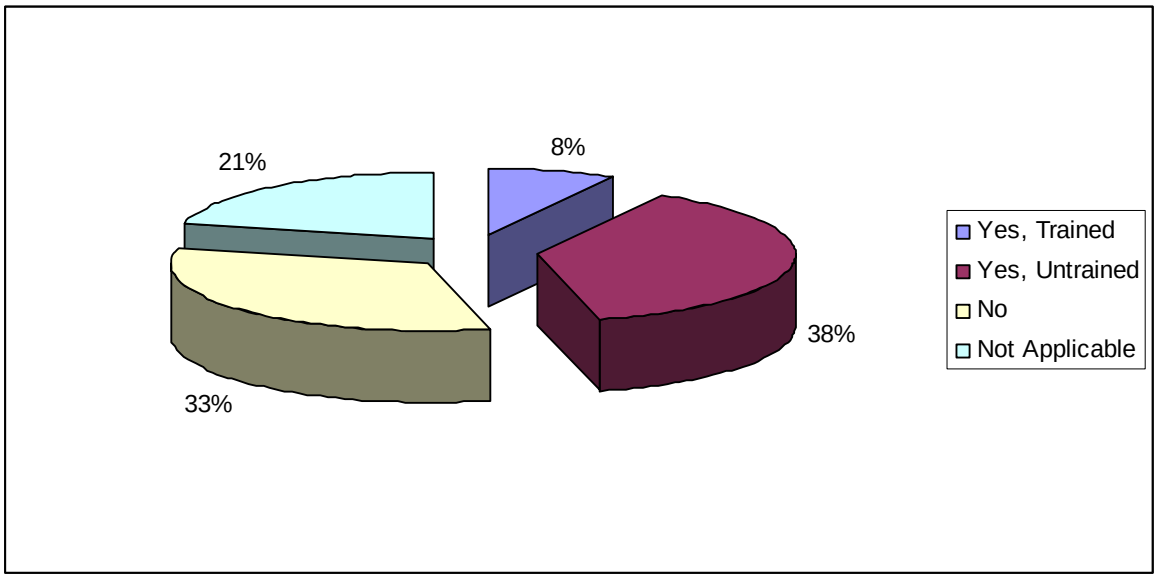

Figure 10. Percentage of Repsondents that have Access to Interpreters (*n* = 271)

Regarding the introduction of Continuing Professional Development, 45.19% of respondents indicated their intention to remain registered on both the Speech Language Therapy and Audiology registers, while 24.44% indicated that they would only maintain one registration. A total of 21.11% were undecided (suggesting that they were eligible for dual registration) and 9.26% reported that the question was not applicable – suggesting that they had completed a split curriculum and were thus only eligible for registration on one or the other register. The majority of respondents are thus intending to maintain their dual registration which is interesting given that only 30% of respondents indicated that they are practicing as both speech therapists and audiologists.

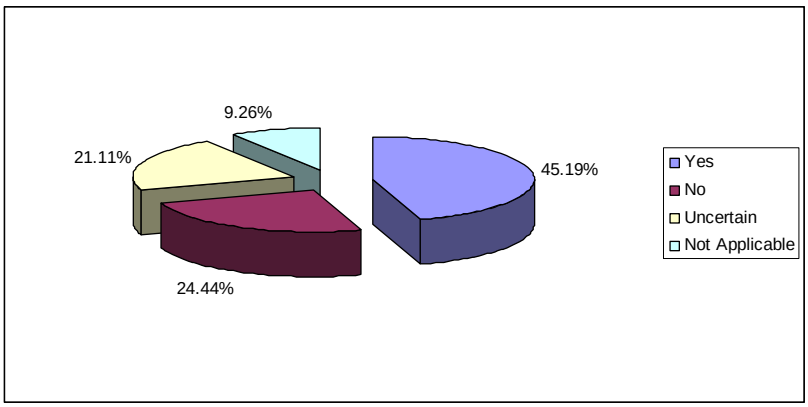

Figure 11. Intention of respondents to maintain dual registration for CPD (*n*=271)

2.9. Data Analysis

The results of the questionnaire were analysed separately by the researchers to comply with degree requirements. As a first step in the process of inferential analysis, tests of reliability or consistency of the responses were performed. Reliability refers to the extent to which a measurement is consistent and reproducible (Hammond, 2000). A convenient manner for estimating the reliability of a questionnaire is to examine its internal reliability. Internal reliability suggests that each part of the questionnaire is consistent with all other parts (Hammond, 2000). The reliability of the questionnaire was determined the coefficient of reliability known as Cronbach's alpha, as it is generally assumed that this is one of the most accurate estimates of reliability available within the classical test approach (Hammond, 2000).

2.10. Equivalence Reliability

Equivalence reliability implies that when a researcher uses multiple indicators, they yield consistent results. Cronbach's alpha is a measure of how well a set of items or variables measures a single one-dimensional latent construct (Hammond, 2000). When data have a multidimensional structure, the value of Cronbach's alpha will usually be low. If the inter-item correlations are high, this suggests that the items are measuring the same underlying construct and that there is a high level of internal consistency. An alpha coefficient value of 0.70 is sufficient to conclude that the questionnaire is reliable (Hammond, 2000).

Table 10. Test of Reliability for Perceived Adequacy of Theoretical Undergraduate Training.

Cronbach's Coefficient Alpha with Deleted Variable				
Variable	**Raw Variables**		**Standardized Variables**	
	Correlation with Total	**Alpha**	**Correlation with Total**	***Alpha***
Basic Audiology - Theoretical	0.548488	0.905321	0.557269	0.906071
Diagnostic and Electrophysiology Tests - Theoretical	0.761687	0.879002	0.7654	0.883042
Paediatric Audiology - Theoretical	0.632713	0.89355	0.646684	0.896378
Amplification - Theoretical	0.718643	0.884028	0.711723	0.889138
Hearing Conservation and Prevention - Theoretical	0.787565	0.87664	0.780945	0.881256
Habilitation and Rehabilitation - Theoretical	0.772587	0.877824	0.764762	0.883115
Miscellaneous - Theoretical	0.786819	0.875703	0.771849	0.882302
Cronbach's Coefficient Alpha - Overall				
Variables			***Alpha***	
Raw				0.900193
Standardized				0.903327

Table 11. Test of Reliability for Perceived Adequacy of Clinical Undergraduate Training

Variable	Raw Variables		Standardized Variables	
	Correlation with Total	Alpha	Correlation with Total	Alpha
Basic Audiology - Clinical	0.578516	0.867866	0.593835	0.871537
Diagnostic and Electrophysiology Tests - Clinical	0.700554	0.847371	0.705958	0.857293
Paediatric Audiology - Clinical	0.633788	0.856459	0.660963	0.863077
Amplification - Clinical	0.700289	0.84794	0.694197	0.858814
Hearing Conservation and Prevention - Clinical	0.649253	0.856602	0.644226	0.865205
Habilitation and Rehabilitation - Clinical	0.680035	0.850453	0.680797	0.860539
Miscellaneous - Clinical	0.675646	0.851056	0.671337	0.861752

Cronbach's Coefficient Alpha	
Variables	***Alpha***
Raw	0.872495
Standardized	0.879924

The results of displayed in tables 10 and 11 show the reliability of the questionnaire for the adequacy of theoretical and clinical undergraduate training respectively. All levels of Cronbach's Alpha a reported above 0.85, which indicates a high level of consistency.

2.11. Test for Normal Distribution

In order to determine appropriate analysis techniques, a test of normal distribution was performed separately for the theoretical and clinical undergraduate training. Normal-based significance tests assume that the variables under consideration are normally distributed. When the assumption of normal distribution does not hold true, significance tests should be based on non-parametric techniques. A variable is considered to be normally distributed if at the 5% significance level if the observed probability value is greater than 0.05 (Salkind, 2000).

The results of the test of normal distribution are shown in Table 12. Only the probability values for Amplification (theoretical) and Habilitation and Rehabilitation (theoretical) are greater than 0.05, indicating a normal distribution. All the other variables are not normally distributed and therefore the analyses of these variables were performed using non-parametric techniques.

Table 12. Test of Normal Distribution for the Perceived Adequacy of Undergraduate Training

Variable	*n*	Mean	STD	Skewness	Median	Probability
Amplification - Clinical	152	3.33	1.57	0.42	3.10	0.00
Amplification - Theoretical	**152**	**3.31**	**1.52**	**0.23**	**3.25**	**0.06**
Basic Audiology - Clinical	153	5.91	0.83	-0.61	6.00	0.00
Basic Audiology - Theoretical	154	5.94	0.78	-0.55	6.00	0.00
Diagnostic and Electrophysiology Tests - Clinical	150	3.29	1.43	0.36	3.00	0.00
Diagnostic and Electrophysiology Tests - Theoretical	154	3.25	1.69	-0.03	3.42	0.01
Habilitation and Rehabilitation - Clinical	150	3.83	1.34	0.24	3.69	0.00
Habilitation and Rehabilitation - Theoretical	**152**	**3.81**	**1.51**	**0.07**	**3.67**	**0.13**
Hearing Conservation and Prevention - Clinical	149	4.09	1.62	-0.15	4.25	0.00
Hearing Conservation and Prevention - Theoretical	152	4.21	1.84	-0.38	4.75	0.00
Miscellaneous - Clinical	149	4.33	1.33	-0.06	4.33	0.04
Miscellaneous - Theoretical	151	3.68	1.62	-0.11	3.86	0.01
Paediatric Audiology - Clinical	149	5.32	1.32	-1.00	5.50	0.00
Paediatric Audiology - Theoretical	154	5.15	1.47	-1.31	5.25	0.00

2.12. Inferential Statistics

Using appropriate techniques indicated by the test of normal distribution, test statistics were computed to assess the effect of the selected demographic variables on the adequacy of theoretical and clinical undergraduate training and the future audiology curriculum.

Since the section on the adequacy of theoretical and clinical undergraduate training was measured on a 7-point scale the computed average scores were analysed using continuous-based techniques. For the future audiology curriculum section a chi-square test of association technique was applied as the responses on this section were measured on a 4-point scale.

CHAPTER THREE

This chapter details the results of both descriptive and inferential data analysis. The results are displayed in tabular and graphic form and significant results are reported.

3.1. DESCRIPTIVE STATISTICS

3.1.1. Perceptions Regarding the Adequacy of Theoretical Undergraduate Training.

Respondents were asked to rate the perceived adequacy of their theoretical preparation for clinical services on a 7-point Likert scale. The clinical services were divided into six themes, including basic audiology, diagnostic and electrophysiological tests, paediatric audiology, amplification, hearing conservation and prevention, habilitation and rehabilitation and services listed as "miscellaneous". A summary of the perceived adequacy of theoretical undergraduate training is provided in table 12, where the figures in red represent the response of the majority of the respondents.

The following key applies to tables 12 and 13:

CU	Completely Unprepared
PP	Poorly Prepared
SU	Somewhat Unprepared
IDK	I Don't Know
SP	Somewhat Prepared
WP	Well Prepared
CP	Completely Prepared

Figure 12 represents the perceived adequacy of theoretical undergraduate training in terms of basic audiology. In terms of the services included in the "basic audiology" theme, the majority of respondents indicated that they regarded their undergraduate training as "completely preparing" them for the demands of their workplace. The only exception was "cerumen management" for which the respondents felt "somewhat prepared" by their undergraduate theoretical training. This is of interest since cerumen management is not included or even mention in the official scope of practice document issued by the HPCSA. However, the majority response of "somewhat prepared" suggests that participants are of the opinion that they do possess knowledge in this area from their undergraduate training. This has important implications regarding the inclusion of ear canal management in the scope of practice of audiologists in the future as it is clear that even the current curriculum provides insight into the anatomy of the ear canal.

Table 13. The perceived adequacy of preparation offered by the theoretical training of undergraduate audiology programmes.

Summary of Section C: Academic Preparation Theoretical	*n*	% N/A	*n*	% CU	% PP	%SU	% IDK	% SP	% WP	% CP
A. BASIC AUDIOLOGY										
Pure Tone Audiometry (Air & Bone Conduction)	154	0.00	154	0.00	0.00	0.00	0.00	2.60	31.17	**66.23**
Speech Reception Testing	154	0.00	154	0.00	0.00	1.30	0.65	4.55	35.06	**58.44**
Speech Discrimination Testing	154	0.00	154	0.00	0.00	1.30	0.00	6.49	33.12	**59.09**
Tympanometry	154	0.00	154	0.65	0.00	0.65	0.65	9.09	29.87	**59.09**
Acoustic Reflexes	154	0.65	153	0.65	0.00	0.65	1.96	19.61	31.37	**45.10**
Cerumen Management	154	18.18	126	15.08	12.70	6.35	5.56	**29.37**	14.29	16.67
B. DIAGNOSTIC AND ELECTROPHYSIOLOGICAL TESTS										
Behavioural Site of Lesion Tests	154	7.14	143	3.50	2.80	4.90	4.90	**31.47**	26.57	25.87
Behavioural Auditory Processing Tests	154	10.39	138	5.80	8.70	7.25	5.80	**28.26**	25.36	18.84
Otoacoustic Emissions (OAEs)	154	18.83	125	6.40	4.00	8.80	3.20	**30.40**	25.60	21.60
Auditory Brainstem Response (ABR)	152	5.92	143	2.80	6.99	6.29	3.50	**33.57**	26.57	20.28
Middle Latency Response (MLR)	153	20.92	121	9.09	16.53	13.22	6.61	**33.88**	14.05	6.61
Late Latency Response (LLR)	153	22.88	118	11.02	16.10	12.71	8.47	**32.20**	13.56	5.93
P300	153	30.07	107	16.82	18.69	9.35	5.61	**30.84**	13.08	5.61
Mismatch Negativity (MMN)	152	**38.16**	94	32.98	18.09	5.32	8.51	23.40	9.57	2.13
Auditory Steady State Response (ASSR)	153	**39.22**	93	26.88	12.90	8.60	8.60	22.58	13.98	6.45
Electrocochleography (ECochG)	152	24.34	115	18.26	20.87	9.57	6.96	**27.83**	12.17	4.35
Electronystagmography (ENG)	151	17.88	124	18.55	16.13	12.90	5.65	**23.39**	12.10	11.29
Neurological Intraoperative Monitoring	152	**41.45**	89	38.20	19.10	14.61	4.49	13.48	5.62	4.49
C. PAEDIATRIC AUDIOLOGY										
Behavioural Observation Audiometry (BOA)	154	1.95	151	0.66	1.99	2.65	1.32	15.89	38.41	**39.07**
Visual Reinforcement Audiometry (VRA)	154	5.84	145	2.07	1.38	0.69	2.07	15.17	**42.07**	36.55
Play Audiometry	154	3.25	149	1.34	0.67	0.67	2.68	14.09	39.60	**40.94**
Multifrequency Tympanometry	153	**27.45**	111	18.02	8.11	8.11	7.21	23.42	20.72	14.41
D. AMPLIFICATION										
Real Ear Measures and Insertion Gain	152	13.16	132	9.85	12.12	9.09	3.79	**35.61**	17.42	12.12
Hearing Aid Selection & Fitting (Adults)	152	0.00	152	3.95	15.13	9.87	1.32	**35.53**	17.76	16.45
Hearing Aid Selection & Fitting (Paediatrics)	152	3.29	147	8.16	16.33	12.93	2.72	**35.37**	11.56	12.93
Hearing Aid Verification & Validation (Adults)	152	1.97	149	6.04	17.45	10.07	8.72	**25.50**	19.46	12.75
Hearing Aid Verification & Validation (Paediatrics)	152	3.29	147	10.88	17.01	12.24	10.20	**29.25**	11.56	8.84
Earmould Modifications	152	7.24	141	10.64	13.48	17.02	6.38	**22.70**	15.60	14.18
Fine Tuning Using HI-PRO and NOAH	151	**30.46**	105	28.57	19.05	12.38	9.52	17.14	7.62	5.71
Fine Tuning Using Manual Trimmers	151	9.27	137	8.03	18.98	12.41	2.92	**26.28**	20.44	10.95
Bond Anchored Devices	151	28.48	108	**28.70**	19.44	9.26	12.04	19.44	4.63	6.48
Cochlear Implant Mapping	151	35.76	97	**38.14**	16.49	8.25	7.22	13.40	11.34	5.15
Auditory Brainstem Implants	151	**47.02**	80	51.25	15.00	11.25	7.50	11.25	2.50	1.25
Assistive Listening Devices (ALDs)	150	14.00	129	17.83	13.18	10.08	3.88	**28.68**	13.18	13.18
E. HEARING CONSERVATION AND PREVENTION										
Implementation of a Neonatal Screening Programme	151	13.25	131	7.63	11.45	9.92	2.29	**27.48**	18.32	22.90
Community Outreach Screening (Adults & Children)	151	11.92	133	3.01	11.28	8.27	3.01	20.30	**27.82**	26.32
Ototoxicity Monitoring	150	16.00	126	15.87	14.29	8.73	10.32	**30.95**	9.52	10.32
Industrial Audiology	152	5.26	144	4.86	8.33	5.56	4.86	29.17	**30.56**	16.67

F. HABILITATION AND REHABILITATION	*n*	% N/A	*n*	% CU	% PP	%SU	% IDK	% SP	% WP	% CP
Auditory Training	152	4.61	145	2.76	4.14	8.28	2.07	**35.17**	29.66	17.93
Speech Reading	152	8.55	139	5.04	7.19	10.79	5.76	**35.97**	22.30	12.95
Manual Communication Skills (e.g. Sign Language)	152	17.11	126	15.08	16.67	14.29	6.35	**30.16**	12.70	4.76
Language Therapy with a Hearing Impaired Child	152	3.95	146	2.05	4.11	4.11	0.68	31.51	**34.25**	23.29
Cochlear Implant Habilitation	152	**28.95**	108	21.30	10.19	17.59	6.48	12.96	16.67	14.81
Cochlear Implant Rehabilitation	152	**29.61**	107	20.56	11.21	14.95	6.54	14.95	16.82	14.95
Tinnitus Management	151	15.23	128	14.84	15.63	7.03	5.47	**29.69**	17.19	10.16
Vestibular Rehabilitation	151	27.15	110	**28.18**	16.36	16.36	10.91	19.09	4.55	4.55
Counselling Related to the Psychosocial Impact of Hearing Loss	152	3.95	146	1.37	4.11	7.53	2.05	**32.88**	30.82	21.23
G. MISCELLANEOUS										
Audiological Management of HIV-Infected/AIDS Patients	150	**39.33**	91	24.18	8.79	13.19	7.69	25.27	7.69	13.19
Community Work	151	18.54	123	5.69	8.13	8.94	7.32	**26.83**	23.58	19.51
Working with Interpreters	151	19.87	121	14.05	9.92	9.09	0.83	**34.71**	16.53	14.88
Dealing with Deaf Culture Issues	151	11.92	133	10.53	6.77	9.02	8.27	**33.83**	20.30	11.28
Practice Management	150	22.00	117	**27.35**	12.82	10.26	5.13	23.93	14.53	5.98
Designing & Conducting Clinical Research	151	10.60	135	10.00	13.00	4.00	40.00	**30.00**	25.00	18.52
Report Writing & Administration	151	1.32	149	0.67	2.01	2.01	0.67	16.11	35.57	**42.95**
Supervision	149	**31.54**	102	12.00	11.00	12.75	10.78	17.65	16.67	9.80

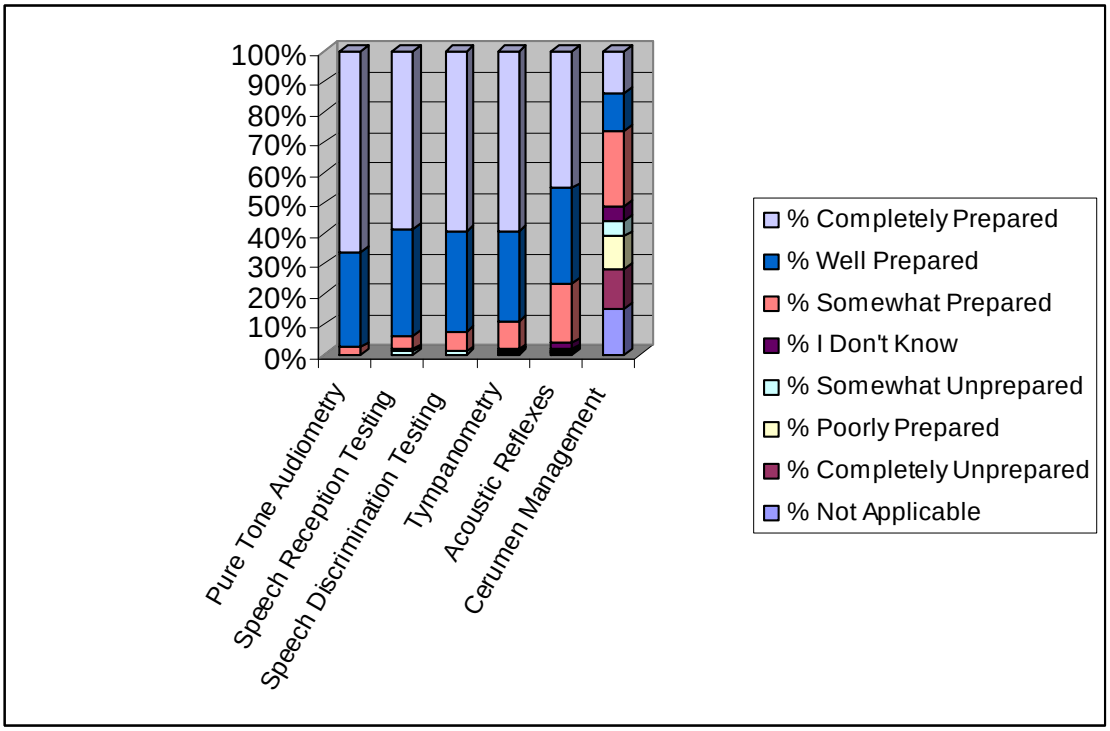

Figure 12. Respondents' perceptions regarding the adequacy of undergraduate theoretical training in basic audiology.

Undergraduate theoretical training was felt to have “somewhat prepared” respondents for diagnostic and electrophysiological testing, with the exception of education regarding the auditory steady state response (ASSR) and mismatch negativity (MMN) procedures as well as neurological interoprative monitoring. The majority of respondents indicated that ASSR (39.22%), MMN (38.16%) and neurological intraoperative monitoring (41.45%) were not included in the curriculum at the time that they studied. This is testimony to the ever-expanding scope of practice in audiology, since none of these clinical activities are excluded from the scope of practice in South Africa (HPCSA, 2005). Figure 13 represents the perceived adequacy of theoretical undergraduate training in diagnostic and electrophysiological tests.

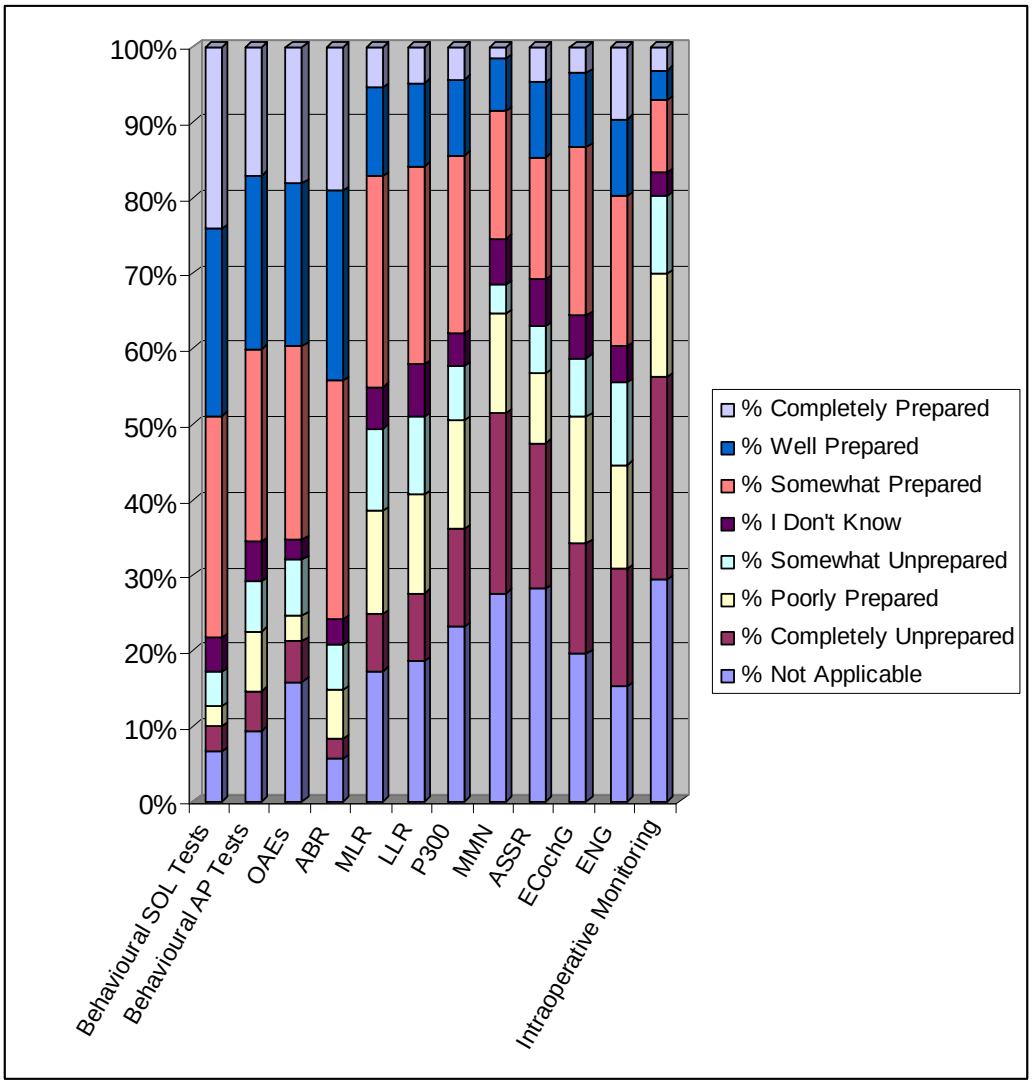

Figure 13. Participant’s perceptions of the adequacy of theoretical training on diagnostic and electrophysiological tests.

Participants generally felt prepared for paediatric audiology by their theoretical undergraduate courses. Participants expressed the opinion that their undergraduate training "completely prepared" them for behavioural observation audiometry (39.07%) and play audiometry (40.49%) and felt "well prepared" for visual reinforcement audiometry. A majority of 27.45% of respondents reported that multifrequency tympanometry was not included in their undergraduate training. Please refer to figure 14 for a graphical representation of the perceived adequacy of undergraduate training in paediatric audiology.

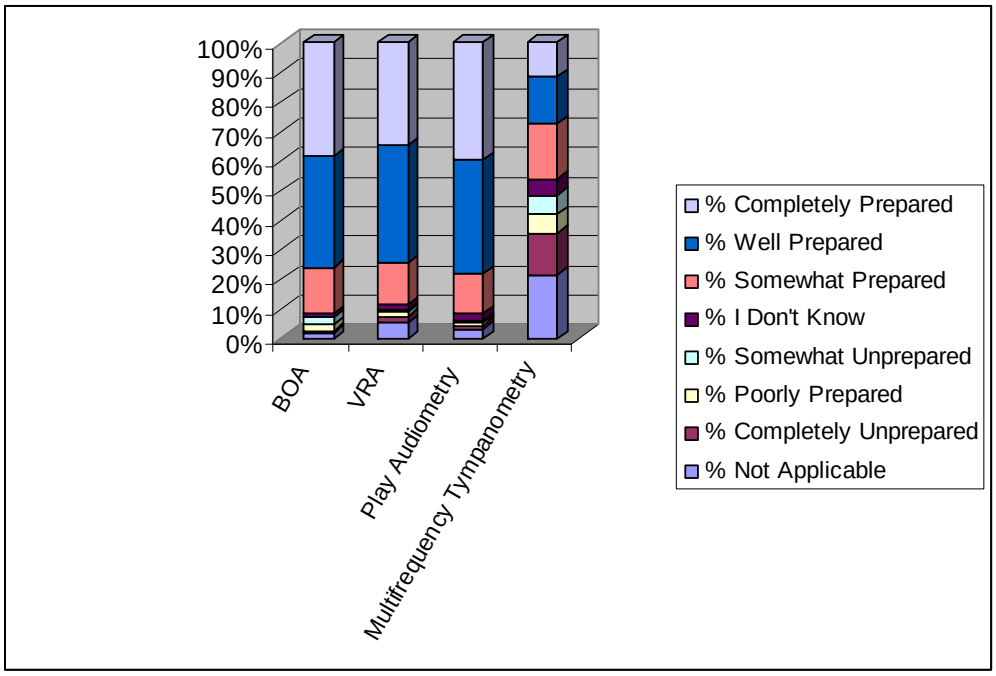

Figure 14. Participants' opinion regarding the adequacy of undergraduate academic training on paediatric audiology.

Audiologists are regarded as the single most important resources for non-medical habilitation or rehabilitation of hearing loss (Roeser, Valente & Hosford-Dunn, 2000) and it is the sale and dispensing of hearing aids that makes private practice financially feasible in South Africa (du Plooy, 2007). These two factors highlight the importance of amplification in the educational curriculum. As demonstrated in figure 15, the majority of respondents felt that their academic education had only "somewhat prepared" them to use real ear measures and insertion gain, to select and fit hearing aids in adults and paediatrics and to verify and validate their fittings. They also only felt "somewhat prepared" regarding the use of assistive listening devices. This is concerning since audiologists are the experts when it comes to non-medical management of hearing loss which usually involves some form of amplification.

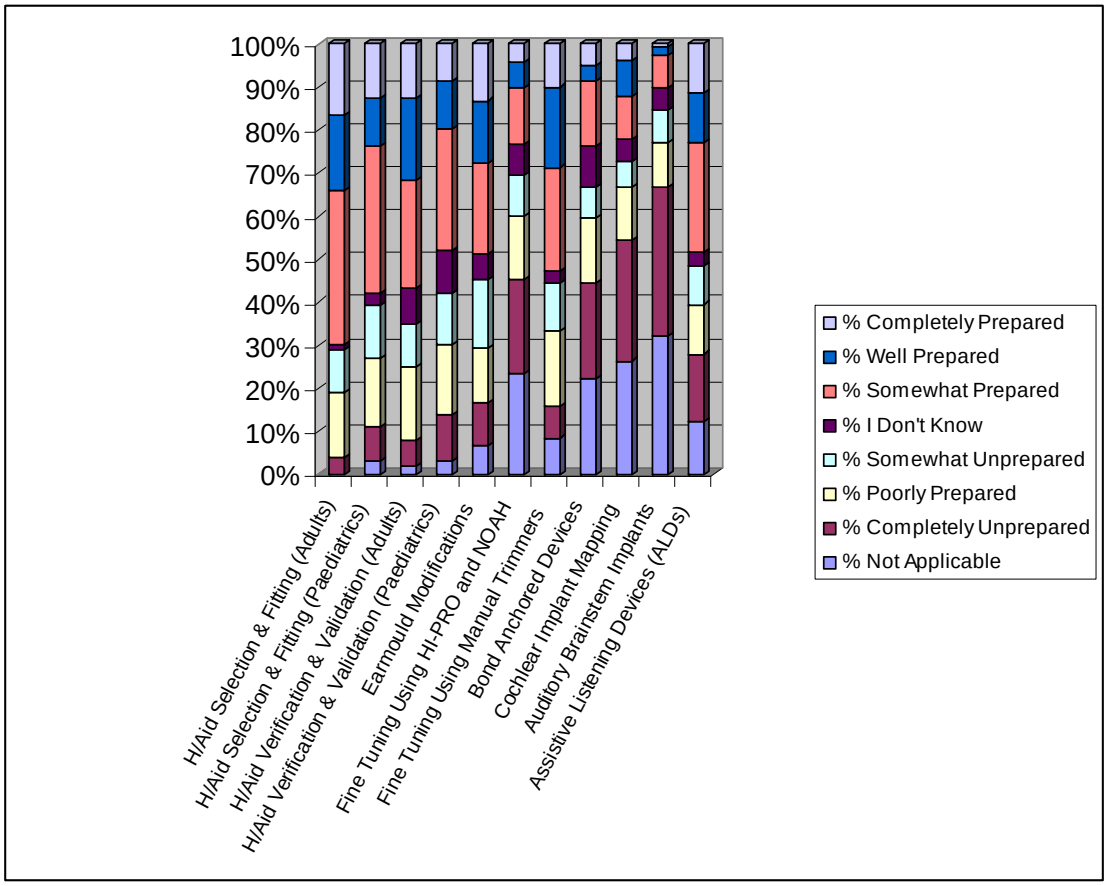

Figure 15. Respondents' perceptions regarding the adequacy of undergraduate theoretical training with regard to amplification.

The majority of respondents indicated that the use of software to programme hearing aids through the NOAH system had not been included in their training. Of concern is that a majority of 28.57% of respondents for whom NOAH was included in the curriculum, expressed the opinion that the training had left them "completely unprepared" in this regard. Digital hearing instruments are generally programmed through manufacturers' software, and while NOAH is not specifically necessary to program a hearing instrument, it is the most widely used data-base used by the profession of audiology.

The majority of respondents indicated that their academic training had "completely unprepared" them for both cochlear implant mapping and the use of bone anchored devices. The fact that respondents felt inadequately trained for cochlear Implant mapping is appropriate since this is excluded from the current scope of practice (HPCSA, 2005) and requires additional licensing. That respondents felt inadequately educated regarding bone anchored devices is problematic in that implantable hearing

aids are becoming more widely used and bone anchored devices are available on the state tender in government hospitals.

Overall, the academic training on the theme of amplification seems to require attention.

In terms of the theme of hearing conservation and prevention, the majority of respondents indicated that they were “somewhat prepared” for the implementation of neonatal hearing screening programs (27.48%), ototoxicity monitoring (30.95%) and industrial audiology (30.56%) by their undergraduate academic curriculum. The majority of participants also indicated that they considered themselves to be “well prepared” or community outreach screening (27.82%) by the theoretical training. Overall, the academic training regarding hearing conservation and prevention seems to be adequate.

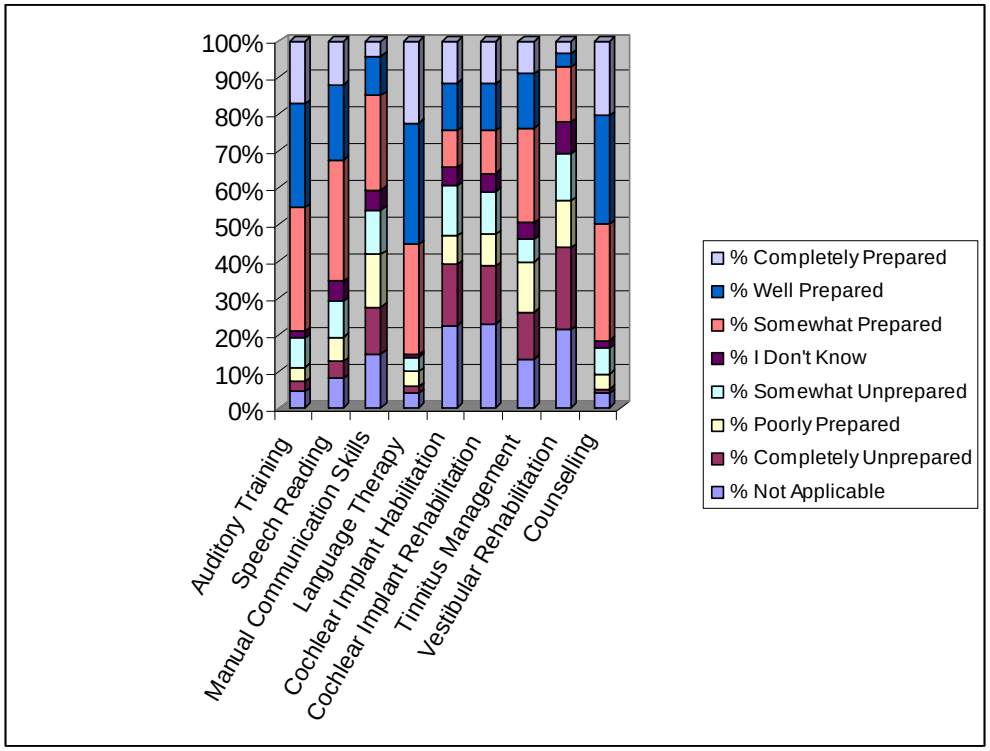

Figure 16. Respondents’ opinions regarding the adequacy of undergraduate academic training regarding hearing conservation and prevention.

Figure 16 represents the perceived adequacy of academic undergraduate training in hearing conservation and prevention. The majority of respondents indicated that their academic training had “somewhat prepared” them for (re)habilitation services. This included instruction in auditory training (35.17%), speech reading (35.97%), manual communication skills (30.16%), tinnitus management (29.69%) and counselling (32.88%). Interestingly, a majority of 34.25% felt “well prepared” for

language therapy with hearing impaired children, which is most likely a testimony to the current structure of training programmes in South Africa which provide a strong basis in speech pathology. Cochlear implant (re)habilitation was excluded from the curriculum of the majority of the participants, and those who did cover it in their academic training felt “completely unprepared”. This is of concern in that the audiologist responsible for mapping the cochlear implant (which requires additional licensing), does not have to be the same professional responsible for (re)habilitation.

The majority of respondents either indicated that their academic training left them “completely unprepared” for vestibular rehabilitation (28.18%) or indicated that it was not included in their curriculum (27.15%). This is appropriate since vestibular rehabilitation is excluded from the current scope of practice (HPCSA, 2005).

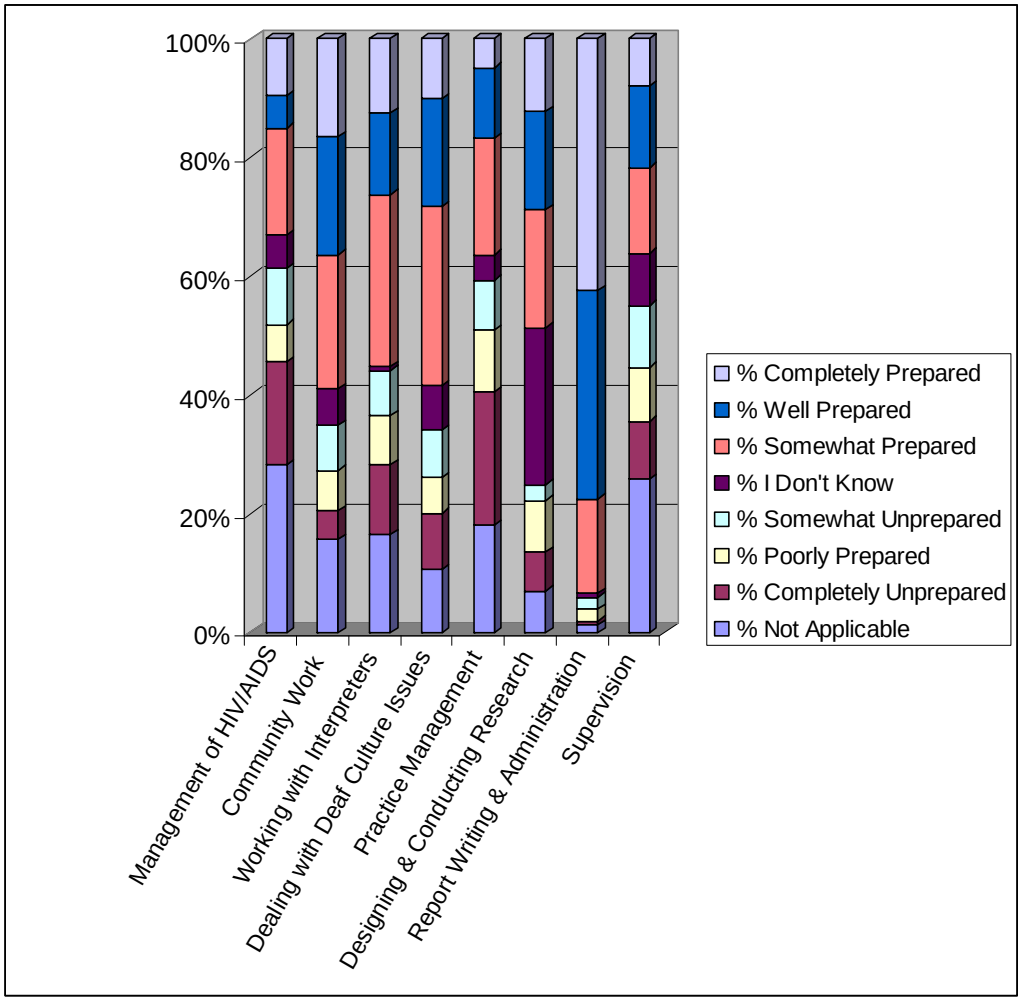

Figure 17. The perceived adequacy of undergraduate theoretical training on miscellaneous items.

The perceived adequacy of academic undergraduate training in the various areas listed under the theme of "Miscellaneous" is depicted in figure 17. Of concern is the fact that the majority of respondents (39.99%) reported that the audiological management of HIV/AIDS patients had not been included in their academic curriculum. Of those who did have audiology included in the curriculum, the majority (25.27%) reported that the academic curriculum had "somewhat prepared" them to deal with HIV/AIDS and 24.18% felt "completely unprepared". This is of concern given that sensorineural hearing loss, both unilateral and bilateral occurs in 21 to 49% of HIV-infected patients (Prasad, Bhojwani, Shenoy & Prasad, 2006).

The majority of respondents felt "somewhat prepared" for community work (26.83%), working with interpreters (34.71%), dealing with Deaf culture issues (33.83%) and designing and conducting clinical research (30%) by the academic undergraduate curriculum.

The majority of participants were of the opinion that their undergraduate education left them "completely unprepared" for practice management, while 22% indicated that it had not been included in the undergraduate curriculum. This is concerning given the number of audiologists employed in private practice. It implies that audiologists are not provided with business and management skills, which are useful in both the private and state sectors. Community Service Officers are often required to manage budgets, for which their undergraduate degree does not prepare them. Supervision of students and junior audiologists was not included in the curriculum for a majority of 31.54% of respondents, despite the fact that this is a minimum competency required of new graduates by the HPCSA.

3.1.2. Perceptions Regarding the Adequacy of Clinical Undergraduate Training.

Respondents were asked to rate the perceived adequacy of their clinical training for clinical services on a 7-point Likert scale. The clinical services were divided into five themes, including basic audiology, diagnostic and electrophysiological tests, paediatric audiology, amplification and hearing conservation and prevention. Table 14 provides a summary of the perceived adequacy of clinical undergraduate training for each clinical service.

The majority of respondents reported that their clinical undergraduate training "completely prepared" them to complete a basic test battery, including pure tone audiometry (62.5%), speech reception testing (52.94%), speech discrimination (53.29%), tympanometry (53.64%) and acoustic reflexes (37.75%). Despite reporting that their theoretical training had "somewhat prepared" them for cerumen management, the majority of respondents (26%) reported that their clinical training had left them "completely unprepared" for cerumen management. This seems appropriate in the current

scope of practice in audiology makes no mention of cerumen management. However, of concern in this regard is the fact that responses varied and 13.82% of respondents indicated that they felt "completely prepared" to perform cerumen management. Figure 18 provides a graphical representation of the perceived adequacy of undergraduate clinical training in basic audiology.

Table 14. The Adequacy of Clinical Preparation Offered by Undergraduate Audiology Programmes.

Summary of Section C: Clinical Preparation	*n*	% N/A	*n*	% CU	% PP	%SU	% IDK	% SP
A. BASIC AUDIOLOGY								
Pure Tone Audiometry (Air & Bone Conduction)	152	0.00	0.00	0.00	0.66	7.89	28.95	**62.50**
Speech Reception Testing	153	0.00	1.31	0.00	1.31	9.15	35.29	**52.94**
Speech Discrimination Testing	152	0.00	1.97	0.00	0.00	12.50	32.24	**53.29**
Tympanometry	151	0.66	0.00	0.66	1.32	10.60	33.11	**53.64**
Acoustic Reflexes	151	0.66	0.00	5.96	2.65	23.18	29.80	**37.75**
Cerumen Management	123	**26.00**	22.76	10.57	7.32	19.51	4.88	13.82
B. DIAGNOSTIC AND ELECTROPHYSIOLOGICAL TESTS								
Behavioural Site of Lesion Tests	141	7.80	10.64	8.51	5.67	**39.72**	12.06	15.60
Behavioural Auditory Processing Tests	133	13.53	18.05	6.77	9.02	**30.08**	10.53	12.03
Otoacoustic Emissions (OAEs)	121	14.88	11.57	6.61	6.61	**28.10**	17.36	14.88
Auditory Brainstem Response (ABR)	139		18.71	11.51	6.47	**24.46**	16.55	11.51
Middle Latency Response (MLR)	117	**32.48**	20.51	14.53	10.26	9.40	7.69	5.13
Late Latency Response (LLR)	115	**33.91**	20.87	13.04	11.30	10.43	6.09	4.35
P300	106	**41.51**	18.87	10.38	10.38	8.49	7.55	2.83
Mismatch Negativity (MMN)	94	**53.19**	19.15	3.19	8.51	7.45	7.45	1.06
Auditory Steady State Response (ASSR)	92	**41.30**	16.30	8.70	14.13	9.78	8.70	1.09
Electrocochleography (ECochG)	110	**49.09**	17.27	8.18	7.27	11.82	5.45	0.91
Electronystagmography (ENG)	122	**41.80**	20.49	13.11	4.92	12.30	4.10	3.28
Neurological Intraoperative Monitoring	89	**65.17**	8.99	12.36	5.62	6.74	1.12	0.00
C. PAEDIATRIC AUDIOLOGY								
Behavioural Observation Audiometry (BOA) (e.g. noisemakers, checklists)	149	2.68	3.36	6.71	2.68	20.81	29.53	**34.23**
Visual Reinforcement Audiometry (VRA)	143	3.50	1.40	7.69	2.80	21.68	29.37	**33.57**
Play Audiometry	147	2.04	0.68	3.40	2.04	16.33	37.41	**38.10**
Multifrequency Tympanometry	109	**24.77**	11.01	13.76	7.34	22.94	11.01	9.17
D. AMPLIFICATION								
Real Ear Measures and Insertion Gain	132	17.42	**23.48**	13.64	5.30	18.94	11.36	9.85
Hearing Aid Selection & Fitting (Adults)	150	10.00	22.67	10.00	3.33	**30.67**	12.67	10.67
Hearing Aid Selection & Fitting (Paediatrics)	144	14.58	22.22	13.19	8.33	**29.17**	4.17	8.33
Hearing Aid Verification & Validation (Adults)	149	10.47	**23.49**	14.09	6.71	**23.49**	10.07	11.41
Hearing Aid Verification & Validation (Paediatrics)	146	17.12	21.92	15.75	7.53	**26.71**	3.42	7.53
Earmould Modifications	138	21.01	**20.29**	16.67	5.80	16.67	10.87	8.70
Fine Tuning Using HI-PRO and NOAH	105	**39.05**	19.05	9.52	7.62	16.19	3.81	4.76

Fine Tuning Using Manual Trimmers	137	15.33	**21.90**	12.41	2.19	21.17	15.33	11.68
Bond Anchored Devices	107	**49.33**	18.69	6.54	8.41	10.28	3.74	2.80
Cochlear Implant Mapping	96	**52.08**	18.75	5.21	8.33	10.42	3.13	2.08
Auditory Brainstem Implants	79	**70.89**	8.86	6.33	6.33	5.06	1.27	1.27
Assistive Listening Devices (ALDs)	128	**28.91**	18.75	9.38	10.94	16.41	7.03	8.59
E. HEARING CONSERVATION AND PREVENTION	*n*	% N/A	*n*	% CU	% PP	%S U	% IDK	% SP
Implementation of a Neonatal Screening Programme	130	13.08	17.69	11.54	3.85	**25.38**	16.15	12.31
Community Outreach Screening (Adults & Children)	131	8.40	9.92	6.87	3.82	19.08	**25.95**	**25.95**
Ototoxicity Monitoring	125	**20.08**	**20.08**	13.60	11.20	15.20	9.60	8.80
Industrial Audiology	142	11.97	14.08	11.97	4.23	**23.24**	21.13	13.38
F. HABILITATION AND REHABILITATION								
Auditory Training	142	5.63	9.86	15.49	6.34	**29.58**	19.72	13.38
Speech Reading	137	11.68	10.22	21.17	5.84	**26.28**	14.60	10.22
Manual Communication Skills (e.g. Sign Language)	125	**24.80**	20.00	20.00	5.60	24.00	3.20	2.40
Language Therapy with a Hearing Impaired Child	145	4.14	7.59	7.59	3.45	27.59	**31.03**	18.62
Cochlear Implant Habilitation	108	**30.56**	20.37	10.19	5.56	13.89	10.19	9.26
Cochlear Implant Rehabilitation	107	**28.04**	21.50	9.35	5.61	12.15	12.15	11.21
Tinnitus Management	126	**29.37**	26.19	8.73	5.56	18.25	7.14	4.76
Vestibular Rehabilitation	108	**45.37**	20.37	12.96	11.11	6.48	2.78	0.39
Counselling Related to the Psychosocial Impact of Hearing Loss	144	5.56	7.64	11.81	3.47	27.78	**30.56**	13.19
G MISCELLANEOUS								
Audiological Management of HIV-Infected/AIDS Patients	90	**30.00**	15.56	10.00	6.67	20.00	8.89	8.89
Community Work	123	4.07	8.94	12.20	5.69	**30.89**	21.14	17.07
Working with Interpreters	121	14.05	12.40	19.83	1.65	**29.75**	10.74	11.57
Dealing with Deaf Culture Issues	132	18.18	14.39	9.09	11.36	**29.55**	12.12	5.30
Practice Management	115	**34.78**	16.52	14.78	4.35	13.04	10.43	6.09
Designing & Conducting Clinical Research	134	11.19	8.21	11.94	5.97	**31.34**	14.93	16.42
Report Writing & Administration	148	0.00	0.68	2.70	0.00	16.22	35.14	**45.27**
Supervision	100	**23.00**	13.00	12.00	10.00	15.00	17.00	10.00

The figures in red represent the response of the majority of participants.

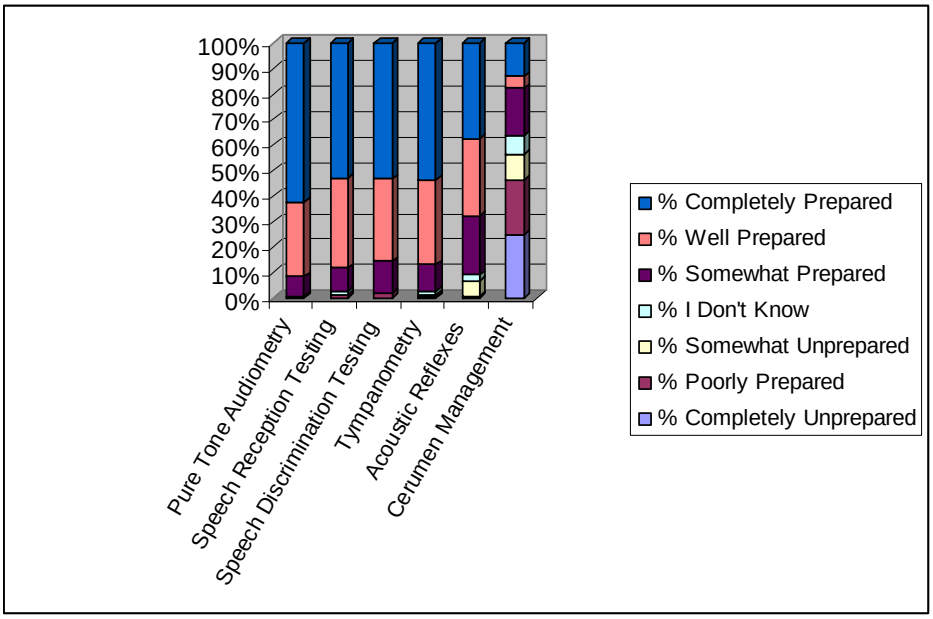

Figure 18. The perceived adequacy of clinical undergraduate training for basic audiology

Figure 19 provides a summary of the perceived adequacy of clinical undergraduate training in diagnostic and electrophysiological tests. The majority of respondents reported that their clinical undergraduate training had "somewhat prepared" them for the use of behavioural site of lesion tests (39.72%), behavioural auditory processing tests (30.08%), otoacoustic emissions (28.10%) and the Auditory Brainstem Response (24.46%). The majority of respondents reported feeling "completely unprepared" in terms of the middle and late latencies, as well as the use of the Auditory Steady State Response (41.30%). The majority of respondents also felt "completely unprepared" to clinically apply electrocochleaography (49.09%), electronystagmography (41.80%) and intraoperative monitoring (65.17%).

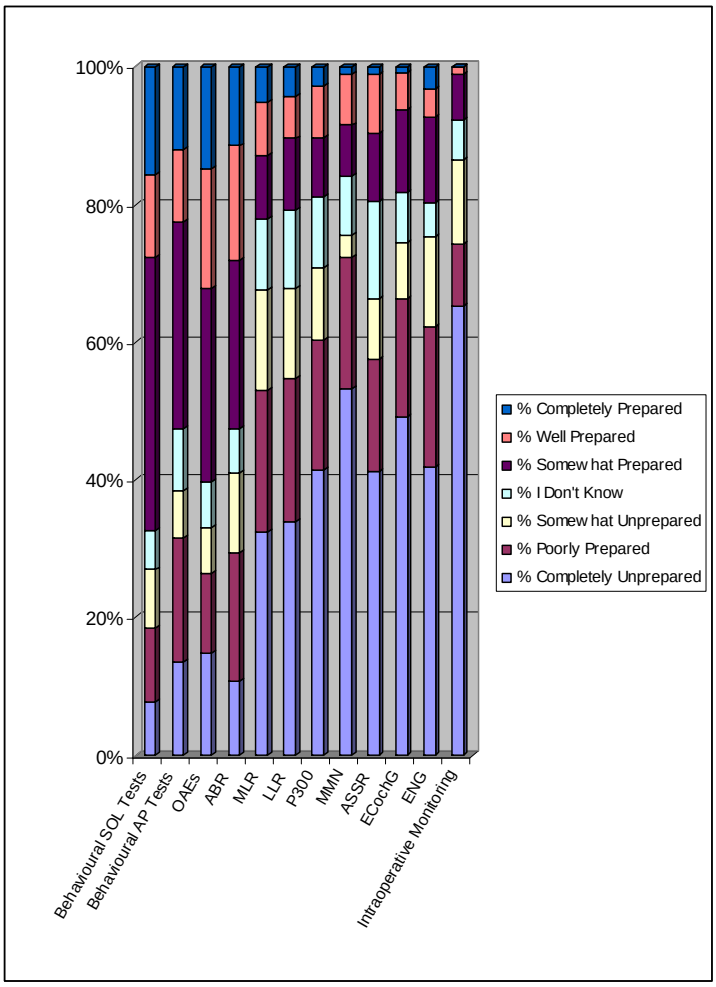

Figure 19. The perceived adequacy of clinical undergraduate training for diagnostic and electrophysiological tests

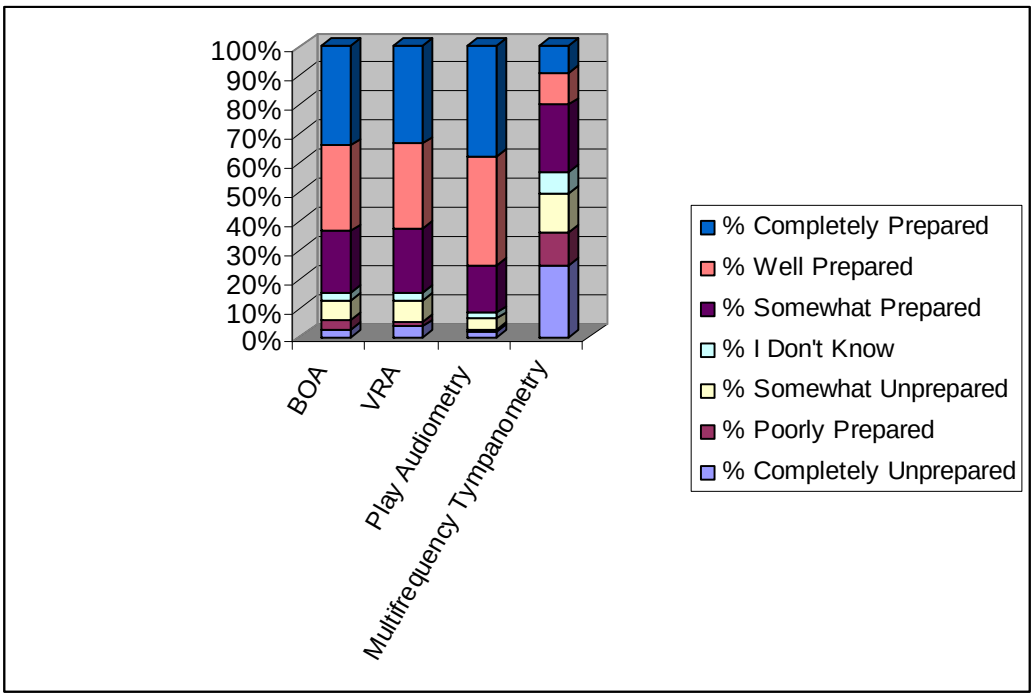

Figure 20. The perceived adequacy of clinical undergraduate training for paediatric audiology.

Figure 20 depicts the perceived adequacy of clinical undergraduate training in paediatric audiology. With the exception of multifrequency tympanometry, the majority of respondents felt “completely prepared” by their clinical undergraduate training to complete paediatric testing using behavioural observation audiometry (34.23%), visual reinforcement audiometry (33.57%) and play audiometry (38.10%). The majority of respondents (24.77%) felt “completely unprepared” regarding the use of multifrequency tympanometry, followed by 22.94% who felt “somewhat prepared”.

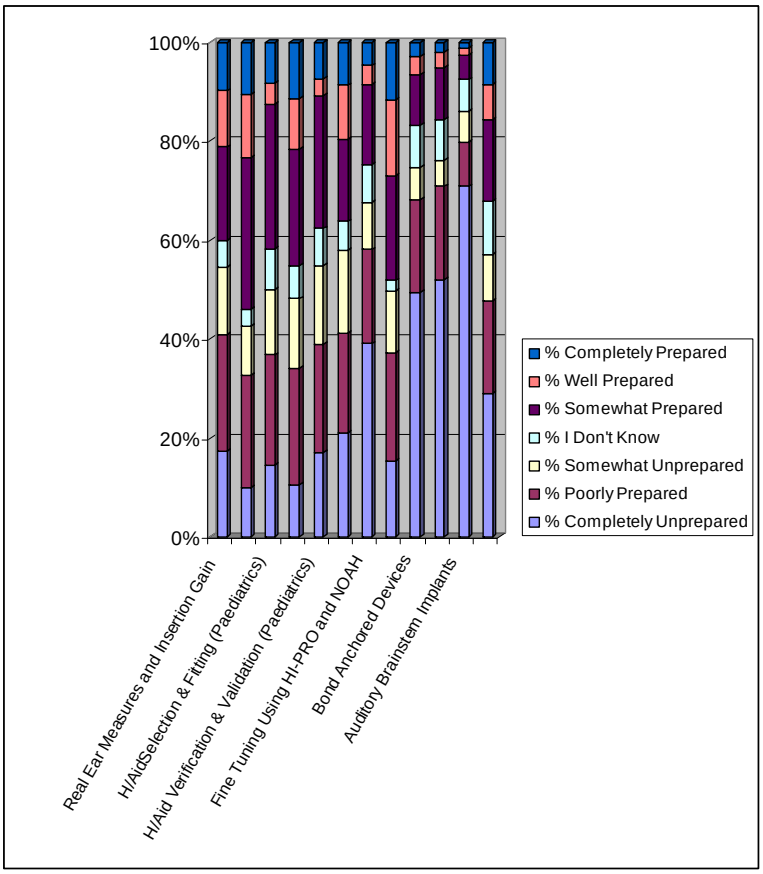

Figure 21. The perceived adequacy of clinical undergraduate training for amplification.

In terms of clinical preparation afforded for the theme of amplification, there was a great deal of variation in responses. The majority of respondents (23.485) of participants reported feeling "poorly prepared" to perform real ear and insertion gain measures. The majority of respondents were of the opinion that clinical undergraduate training only "somewhat prepared" them for hearing aid selection, fitting, verification and validation in adults and paediatrics. Of great concern is the fact that the majority of respondents felt completely unprepared regarding the use of NOAH via the Hi-Pro Box for fine tuning. Please refer to figure 21 for a graphical depiction of the perceived adequacy of clinical undergraduate training in amplification.

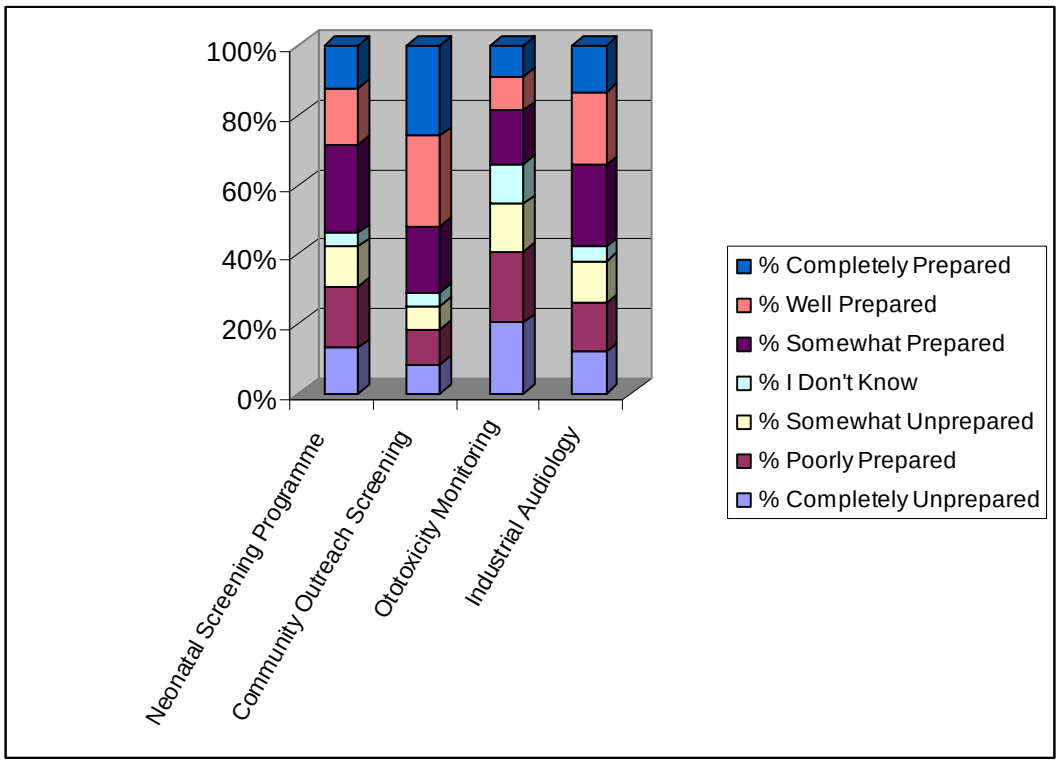

Figure 22. The Percieved Adequacy of Clinical Undergraduate Training for Hearing Conservation and Prevention.

The majority of respondents (25.38%) indicated that their undergraduate clinical training had only "somewhat prepared" to implement a neonatal hearing screening programme. This will need to be revisited in terms of curriculum planning as the HPCSA has recently released a 2007 Position Statement regarding Early Hearing Detection and Intervention programmes which identifies audiologists as the best qualified professionals to develop and implement newborn hearing screening (HPCSA, 2007). The majority of respondents (50.90%) felt either "well prepared" or "completely prepared" to implement community outreach screening programmes for adults and children. The majority of respondents were of the opinion that their undergraduate clinical training had left them either "completely unprepared" (20.08%) or "poorly prepared" (20.08%) to implement ototoxicity monitoring. A majority of 23.24% of respondents felt "somewhat prepared" to offer industrial audiology services. The perceived adequacy of clinical undergraduate training in hearing conservation and prevention is shown in figure 22.

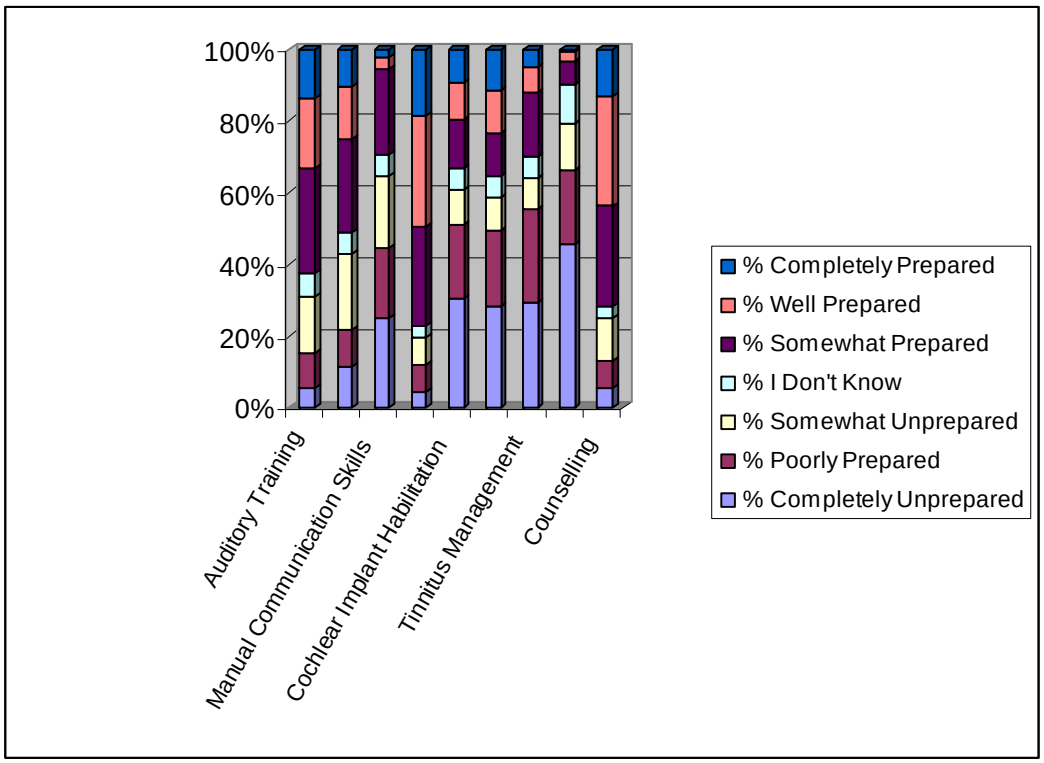

Figure 23. The Percieved Adequacy of Clinical Undergraduate Training for Habilitation and Rehabilitation.

There were many areas of habilitation and rehabilitation for which the majority of the respondents felt that their undergraduate clinical training left them “completely unprepared”. These areas included: manual communication skills (24.80%), cochlear implant habilitation (30.56%), cochlear implant rehabilitation (28.04%), tinnitus management (29.37%) and vestibular rehabilitation (45.37%). The majority of respondents felt that their clinical training had “somewhat prepared” them for auditory training (29.58%) and speech reading (26.28%). The majority of respondents felt well prepared by their undergraduate clinical training for language therapy and counselling.

The majority of respondents were of the opinion that their undergraduate clinical training did not prepare them at all to deal with the audiological management of HIV/AIDS patients (30%), practice management (34.78%) or supervision (23%). The majority of respondents felt “somewhat prepared” by their clinical undergraduate training in terms of community work (30.89%), working with interpreters (29.75%), dealing with Deaf culture issues (29.55%) and the design and implementation of clinical research (31.34%). The majority of respondents (45.27%) felt that their undergraduate clinical training “completely prepared” them in terms of report writing and administration skills.

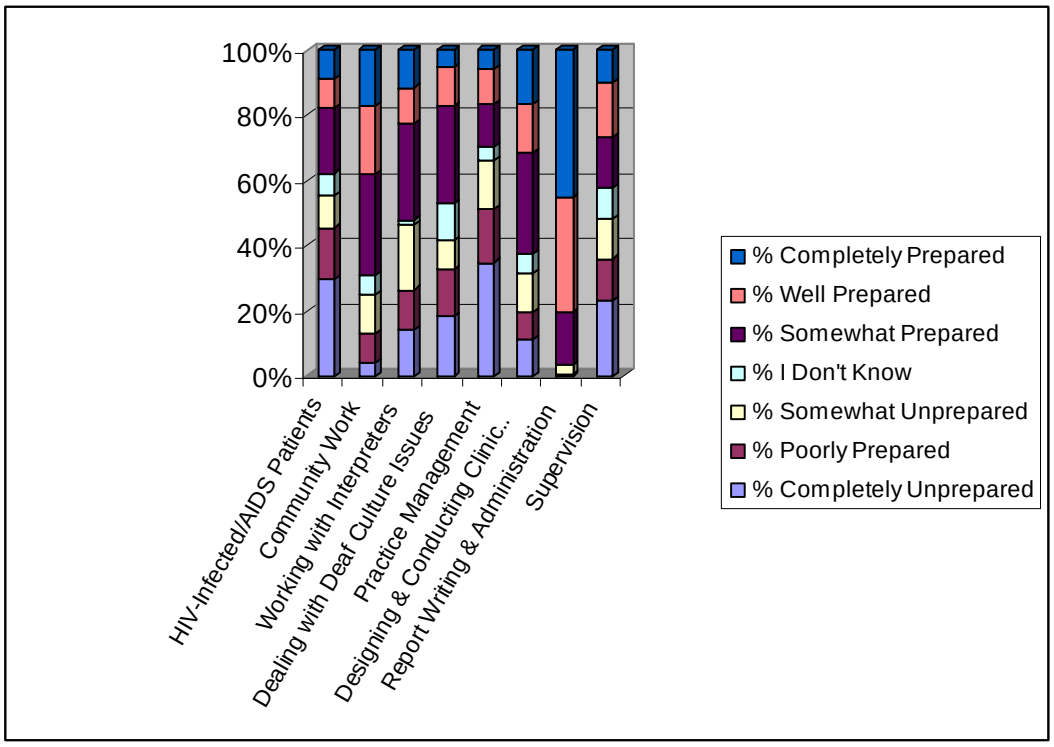

Figure 24. The perceived adequacy of clinical undergraduate training for miscellaneous items.

Table 15 provides a summary of the perceived adequacy of theoretical and clinical undergraduate training across the themes.

In summary, respondents generally felt completely prepared by both their theoretical course and clinical training for all aspects of basic audiology except for cerumen management. This is in keeping with the current legal scope of practice, which does not include cerumen management. What is of interest is the fact that a majority of 29% of respondents were of the opinion that their theoretical training “somewhat prepared” them for cerumen management.

Respondents generally felt somewhat prepared for diagnostic and electrophysiological tests by their theoretical course, but the clinical training left them feeling completely unprepared for applications such as the MLR, LLR and P300 as well as ECochG and ENG. They felt only “ somewhat prepared” by their clinical training in terms of performing OAEs and ABRs, which are considered to be part of a standard test battery by many.

With the exception of multifrequency tympanometry, respondents generally felt that both theoretical courses and clinical training had completely prepared them for paediatric audiology.

Amplification is an area that raised concern from a curriculum point of view. The majority of respondents felt only “somewhat prepared” by their theoretical training to select, fit, verify and validate a hearing aid fitting and to select assistive listening devices. The clinical training in this area was regarded as inadequate and generally left respondents feeling “poorly prepared” or only “somewhat prepared”.

Respondents felt somewhat prepared to complete hearing conservation and prevention programs although the majority reported feeling “completely unprepared” or “poorly prepared” by their clinical training to initiate an ototoxicity monitoring programme.

Cochlear implant habilitation and rehabilitation were generally not included in the undergraduate training in the majority of respondents. This is perhaps an area that could be targeted for CPD. Vestibular rehabilitation was also reported as not having formed part of the undergraduate curriculum of the majority of repsondents, which is in keeping with the minimum competencies set out by the HPCSA which excluded management of vestibular disorders. Respondents generally regarded their clinical training as having completely unprepared them for tinnitus management.

It is concerning that the majority of graduates did not receive training in the audiological management of HIV/AIDS related hearing loss and this is possibly testimony to the growing pandemic. Once again, this is possibly a topic that should be addressed through CPD.

Table 15. A summary of the perceived adequacy of theoretical and clinical and undergraduate training in audiology.

Summary of Section C: Academic Preparation	Theoretical Course	Clinical Training
A. BASIC AUDIOLOGY		
Pure Tone Audiometry (Air & Bone Conduction)	Completely Prepared (66%)	Completely Prepared (63%)
Speech Reception Testing	Completely Prepared (58%)	Completely Prepared (53%)
Speech Discrimination Testing	Completely Prepared (59%)	Completely Prepared (53%)
Tympanometry	Completely Prepared (59%)	Completely Prepared (54%)
Acoustic Reflexes	Completely Prepared (45%)	Completely Prepared (38%)
Cerumen Management	Somewhat Prepared (29%)	Completely Unprepared (26%)
B. DIAGNOSTIC AND ELECTROPHYSIOLOGICAL TESTS		
Behavioural Site of Lesion Tests	Somewhat Prepared (31%)	Somewhat Prepared (40%)
Behavioural Auditory Processing Tests	Somewhat Prepared (28%)	Somewhat Prepared (30%)
Otoacoustic Emissions (OAEs)	Somewhat Prepared (30%)	Somewhat Prepared (28%)
Auditory Brainstem Response (ABR)	Somewhat Prepared (34%)	Somewhat Prepared (24%)
Middle Latency Response (MLR)	Somewhat Prepared (34%)	Completely Unprepared (32%)
Late Latency Response (LLR)	Somewhat Prepared (32%)	Completely Unprepared (34%)
P300	Somewhat Prepared (31%)	Completely Unprepared (42%)
Mismatch Negativity (MMN)	Not Applicable (38%)	Not applicable (53%)
Auditory Steady State Response (ASSR)	Not Applicable (39%)	Not applicable (41%)
Electrocochleography (ECochG)	Somewhat Prepared (28%)	Completely Unprepared (49%)
Electronystagmography (ENG)	Somewhat Prepared (23%)	Completely Unprepared (42%)
Neurological Intraoperative Monitoring	Not Applicable (41%)	Not applicable (65%)
C. PAEDIATRIC AUDIOLOGY		
Behavioural Observation Audiometry (BOA)	Completely Prepared (39%)	Completely Prepared (34%)
Visual Reinforcement Audiometry (VRA)	Well prepared (42%)	Completely Prepared (34%)
Play Audiometry	Completely Prepared (41%)	Completely Prepared (38%)
Multifrequency Tympanometry	Not Applicable (27%)	Not applicable (25%)
D. AMPLIFICATION		
Real Ear Measures and Insertion Gain	Somewhat Prepared (36%)	Poorly Prepared (23.48%)
Hearing Aid Selection & Fitting (Adults)	Somewhat Prepared (36%)	Somewhat Prepared (31%)
Hearing Aid Selection & Fitting (Paediatrics)	Somewhat Prepared (35%)	Somewhat Prepared (29%)
Hearing Aid Verification & Validation (Adults)	Somewhat Prepared (26%)	Poorly Prepared (23%)/Somewhat Prepared (23%)
Hearing Aid Verification & Validation (Paediatrics)	Somewhat Prepared (29%)	Somewhat Prepared (27%)
Earmould Modifications	Somewhat Prepared (23%)	Poorly Prepared (21%)
Fine Tuning Using HI-PRO and NOAH	Not Applicable (30%)	Not applicable (39%)
Fine Tuning Using Manual Trimmers	Somewhat Prepared (26%)	Poorly Prepared (22%)
Bond Anchored Devices	Completely Unprepared (29%)	Completely Unprepared (49%)
Cochlear Implant Mapping	Completely Unprepared (38%)	Completely Unprepared (52%)
Auditory Brainstem Implants	Not Applicable (47%)	Not applicable (71%)
Assistive Listening Devices (ALDs)	Somewhat Prepared (29%)	Completely Unprepared (29%)
E. HEARING CONSERVATION AND PREVENTION		
Implementation of a Neonatal Screening Programme	Somewhat Prepared (27%)	Somewhat Prepared (25%)
Community Outreach Screening (Adults & Children)	Well prepared (28%)	Well Prepared (26%)/Completely Prepared (26%)
Ototoxicity Monitoring	Somewhat Prepared (31%)	Completely Unprepared (20%)/Poorly Prepared (20%)
Industrial Audiology	Somewhat Prepared (31%)	Somewhat Prepared (23%)
F. HABILITATION AND REHABILITATION	**Theoretical Course**	**Clinical Training**
Auditory Training	Somewhat Prepared (35%)	Somewhat Prepared (30%)

Speech Reading	Somewhat Prepared (36%)	Somewhat Prepared (26%)
Manual Communication Skills (e.g. Sign Language)	Somewhat Prepared (30%)	Completely Unprepared (25%)
Language Therapy with a Hearing Impaired Child	Somewhat Prepared (34%)	Well Prepared (31%)
Cochlear Implant Habilitation	Not Applicable (29%)	Not applicable (31%)
Cochlear Implant Rehabilitation	Not Applicable (30%)	Not applicable (28%)
Tinnitus Management	Somewhat Prepared (27%)	Completely Unprepared (29%)
Vestibular Rehabilitation	Not Applicable (28%)	Not applicable (45%)
Counselling Related to the Psychosocial Impact of Hearing Loss	Somewhat Prepared (33%)	Well Prepared (31%)
G. MISCELLANEOUS		
Audiological Management of HIV-Infected/AIDS Patients	Not Applicable (39%)	Not applicable (30%)
Community Work	Somewhat Prepared (27%)	Somewhat Prepared (31%)
Working with Interpreters	Somewhat Prepared (35%)	Somewhat Prepared (30%)
Dealing with Deaf Culture Issues	Somewhat Prepared (34%)	Somewhat Prepared (30%)
Practice Management	Somewhat Prepared (27%)	Completely Unprepared (35%)
Designing & Conducting Clinical Research	Somewhat Prepared (30%)	Somewhat Prepared (31%)
Report Writing & Administration	Well prepared (43%)	Completely (45%)
Supervision	Not Applicable (32%)	Not applicable (23%)

3.1.3. Future Curriculum Design in Terms of Content and Structure

Respondents who had clinical experience in audiology since graduation were asked to indicate the educational level at which each area of clinical service should be included in the curriculum. A summary of the results is shown in Table 16.

Table 16. A summary of the suggested structure of the future audiology curriculum

Summary of Section D: Future Audiology Curriculum	*n*	Undergraduate	Postgraduate	Additional Licensing	Excluded	Majority Decision
A. BASIC AUDIOLOGY						
Pure Tone Audiometry (Air & Bone Conduction)	151	**99.34**	0.66	0.00	0.00	Undergraduate
Speech Reception Testing	151	**99.34**	0.66	0.00	0.00	Undergraduate
Speech Discrimination Testing	151	**99.34**	0.66	0.00	0.00	Undergraduate
Tympanometry	151	**99.34**	0.66	0.00	0.00	Undergraduate
Acoustic Reflexes	151	**98.01**	1.99	0.00	0.00	Undergraduate
Cerumen Management	147	**80.27**	4.76	9.52	5.44	Undergraduate
B. DIAGNOSTIC AND ELECTROPHYSIOLOGICAL TESTS						
Behavioural Site of Lesion Tests	148	**85.81**	9.46	3.38	1.35	Undergraduate
Behavioural Auditory Processing Tests	147	**85.71**	8.84	5.44	0.00	Undergraduate
Otoacoustic Emissions (OAEs)	148	**91.22**	6.08	2.70	0.00	Undergraduate
Auditory Brainstem Response (ABR)	145	**75.17**	17.93	6.90	0.00	Undergraduate
Middle Latency Response (MLR)	145	**44.83**	39.31	15.86	0.00	Undergraduate
Late Latency Response (LLR)	145	**44.14**	40.00	15.86	0.00	Undergraduate
P300	143	40.56	**41.96**	16.78	0.70	Postgraduate
Mismatch Negativity (MMN)	143	38.46	**42.66**	17.48	0.00	Postgraduate
Auditory Steady State Response (ASSR)	144	**52.08**	32.64	15.28	0.00	Undergraduate

Electrocochleography (ECochG)	144	33.33	**40.28**	26.39	0.00	Postgraduate
Electronystagmography (ENG)	144	31.25	**36.11**	30.56	2.08	Postgraduate
Neurological Intraoperative Monitoring	143	20.28	37.06	**39.86**	2.80	Additional Licensing
C. PAEDIATRIC AUDIOLOGY						
Behavioural Observation Audiometry (BOA)	150	**96.00**	1.33	2.67	0.00	Undergraduate
Visual Reinforcement Audiometry (VRA)	150	**94.67**	1.33	4.00	0.00	Undergraduate
Play Audiometry	150	**98.00**	0.67	1.33	0.00	Undergraduate
Multifrequency Tympanometry	147	**91.16**	5.44	3.40	0.00	Undergraduate
D. AMPLIFICATION						
Real Ear Measures and Insertion Gain	148	**90.54**	6.08	3.38	0.00	Undergraduate
Hearing Aid Selection & Fitting (Adults)	150	**92.67**	4.67	2.67	0.00	Undergraduate
Hearing Aid Selection & Fitting (Paediatrics)	149	**83.89**	9.40	6.71	0.00	Undergraduate
Hearing Aid Verification & Validation (Adults)	150	**93.33**	4.00	2.67	0.00	Undergraduate
Hearing Aid Verification & Validation (Paediatrics)	149	**83.89**	10.07	6.04	0.00	Undergraduate
Earmould Modifications	152	**91.45**	4.61	3.95	0.00	Undergraduate
Fine Tuning Using HI-PRO and NOAH	148	**85.14**	10.14	4.73	0.00	Undergraduate
Fine Tuning Using Manual Trimmers	150	**91.33**	6.00	2.67	0.00	Undergraduate
Bond Anchored Devices	149	**62.42**	21.48	15.44	0.67	Undergraduate
Cochlear Implant Mapping	149	29.53	**36.91**	33.56	0.00	Postgraduate
Auditory Brainstem Implants	149	22.82	**39.60**	36.24	1.34	Postgraduate
Assistive Listening Devices (ALDs)	154	**84.00**	8.00	8.00	0.00	Undergraduate
E. HEARING CONSERVATION AND PREVENTION						
Implementation of a Neonatal Screening Programme	150	**88.00**	10.67	1.33	0.00	Undergraduate
Community Outreach Screening (Adults & Children)	151	**96.03**	1.99	1.32	0.66	Undergraduate
Ototoxicity Monitoring	150	**83.33**	11.33	4.67	0.67	Undergraduate
Industrial Audiology	149	**81.88**	9.40	8.72	0.00	Undergraduate
F. HABILITATION AND REHABILITATION						
Auditory Training	151	**90.73**	6.62	2.65	0.00	Undergraduate
Speech Reading	152	**86.18**	7.24	3.95	2.63	Undergraduate
Manual Communication Skills (e.g. Sign Language)	148	**64.19**	8.11	22.97	4.73	Undergraduate
Language Therapy with a Hearing Impaired Child	152	**89.47**	7.24	3.29	0.00	Undergraduate
Cochlear Implant Habilitation	151	**45.03**	33.77	21.19	0.00	Undergraduate
Cochlear Implant Rehabilitation	150	**46.00**	34.67	19.33	0.00	Undergraduate
Tinnitus Management	151	**74.17**	18.54	7.28	0.00	Undergraduate
Vestibular Rehabilitation	149	**40.27**	30.20	28.19	1.34	Undergraduate
Counselling Related to the Psychosocial Impact of Hearing Loss	149	**91.95**	4.70	3.36	0.00	Undergraduate
G MISCELLANEOUS						
Audiological Management of HIV-Infected/AIDS Patients	152	**90.13**	7.89	1.97	0.00	Undergraduate
Community Work	152	**93.42**	3.95	2.63	0.00	Undergraduate
Working with Interpreters	152	**91.45**	3.29	3.29	1.97	Undergraduate
Dealing with Deaf Culture Issues	150	**83.33**	8.67	7.33	0.67	Undergraduate
Practice Management	150	**89.33**	5.33	5.33	0.00	Undergraduate
Designing & Conducting Clinical Research	151	**62.91**	35.10	1.99	0.00	Undergraduate
Report Writing & Administration	151	**98.01**	0.66	1.32	0.00	Undergraduate
Supervision	151	**54.97**	34.44	9.93	0.66	Undergraduate

What is of interest is that respondents were generally unable to differentiate which areas would be appropriate to include in a postgraduate curriculum. The majority of areas were reported to be appropriate at an undergraduate level. This supports a move towards a split curriculum given the number of areas that would need to be taught.

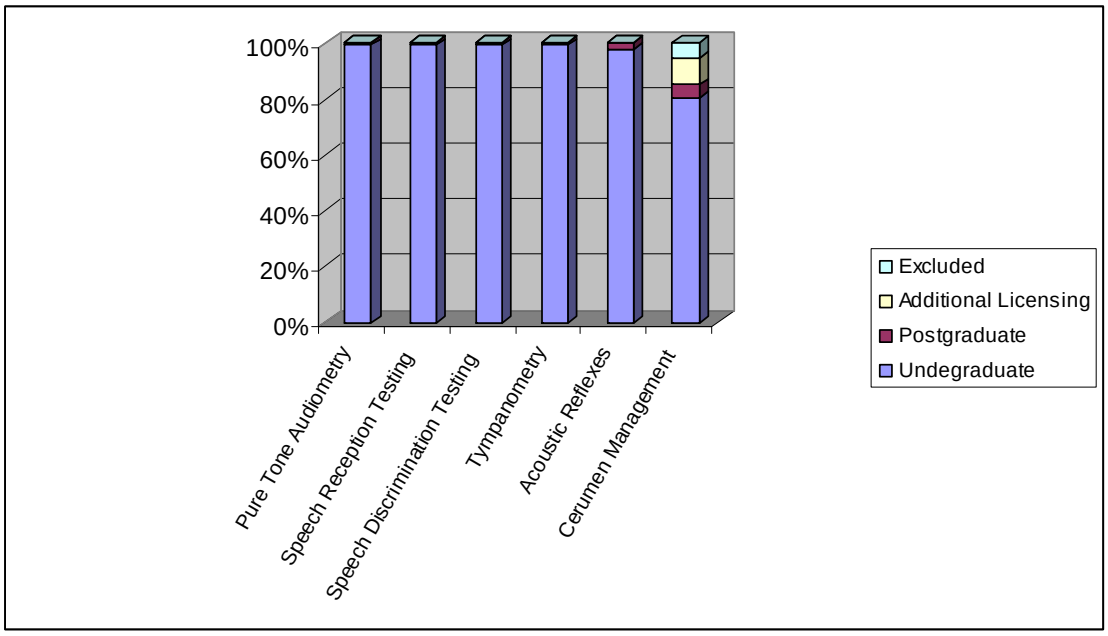

Figure 25. The level at which participants' indicated that basic audiology should be included in the curriculum.

As demonstrated in figure 25, the majority of participants agreed that basic audiology should be included in the undergraduate curriculum. While the majority of respondents (80.27%) agreed that cerumen management should be included in the curriculum at an undergraduate level, 4.74% felt that it should be included at a postgraduate level, 9.52% felt that it should require additional licensing and 5.44 % were of the opinion that it should be excluded from the scope of practice.

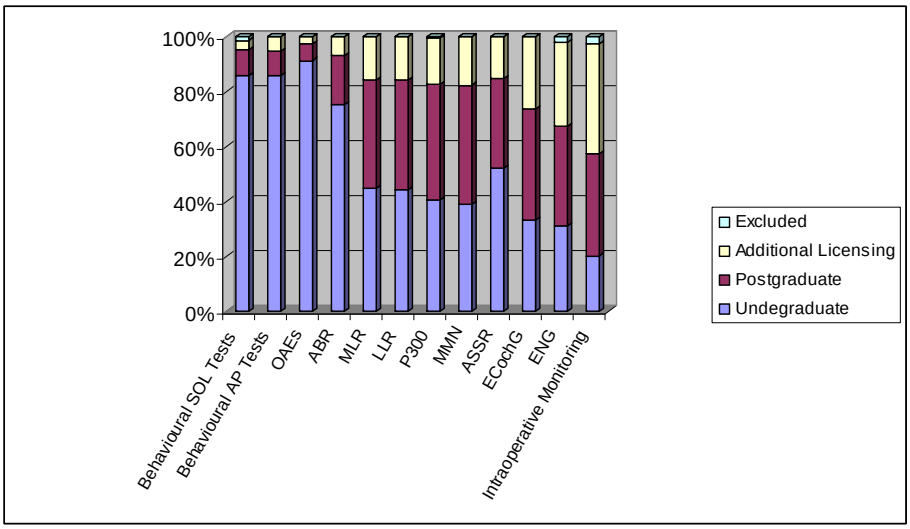

Figure 26. The Level at which Participants' indicated that Diagnostic and Electrophysiological Tests Should be Included in the Curriculum.

The level at which diagnostic and electrophysiological tests should be taught in an academic curriculum is shown in figure 26. The majority of respondents were in agreement that behavioural site of lesion tests, behavioural auditory processing tests, OAEs, ABR, ASSR, MLR and LLR should all be included in the undergraduate curriculum. P300, MMN, ECochG and ENG were all regarded as being more appropriately placed in a postgraduate curriculum. The majority of participants were of the opinion that neurological intraoperative monitoring should require additional licensing.

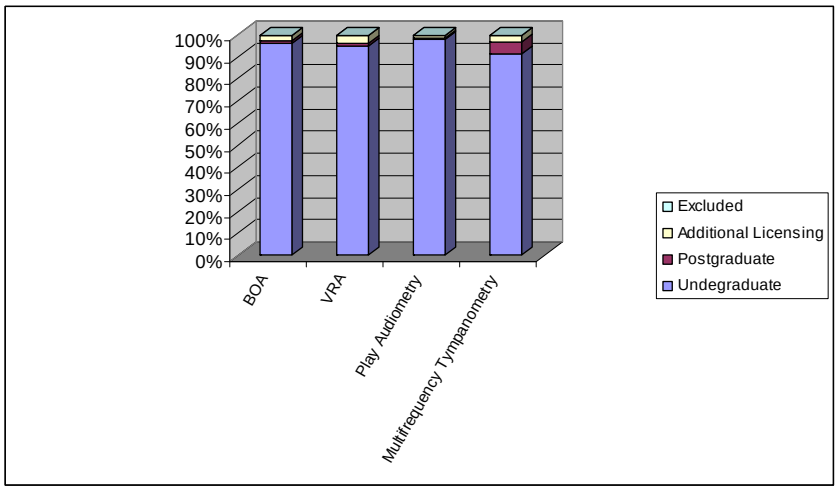

Figure 27. The Level at which Participants' indicated that Paediatric Audiology should be Included in the Curriculum.

There was agreement that paediatric audiology should be included at an undergraduate level, as established in figure 27.

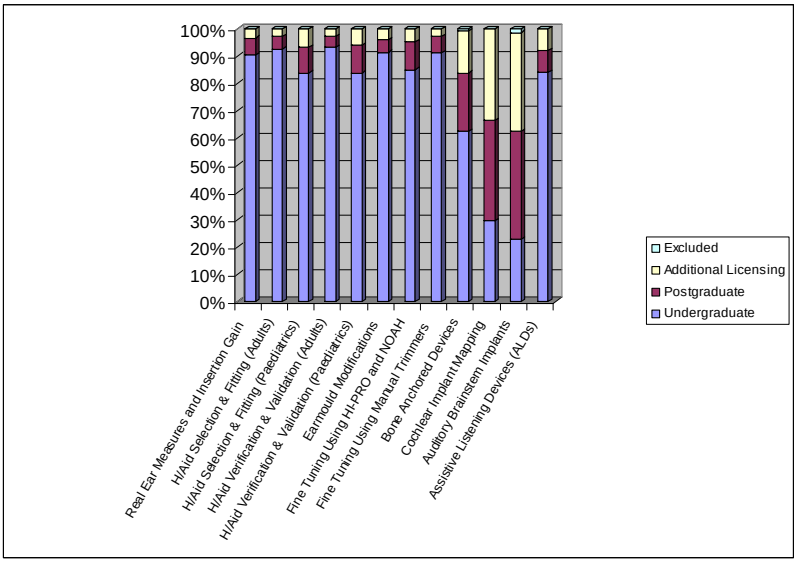

Figure 28. The Level At Which Participants' Indicated That Amplification Should Be Included In The Curriculum.

There was agreement among participants that all services listed under amplification, with the exception of cochlear implant mapping and auditory brainstem implants, should be included at an undergraduate level. The majority of participants were of the opinion that cochlear implant mapping (36.91%) and auditory brainstem implants (39.60%) should be included at a postgraduate level, as indicated in figure 28.

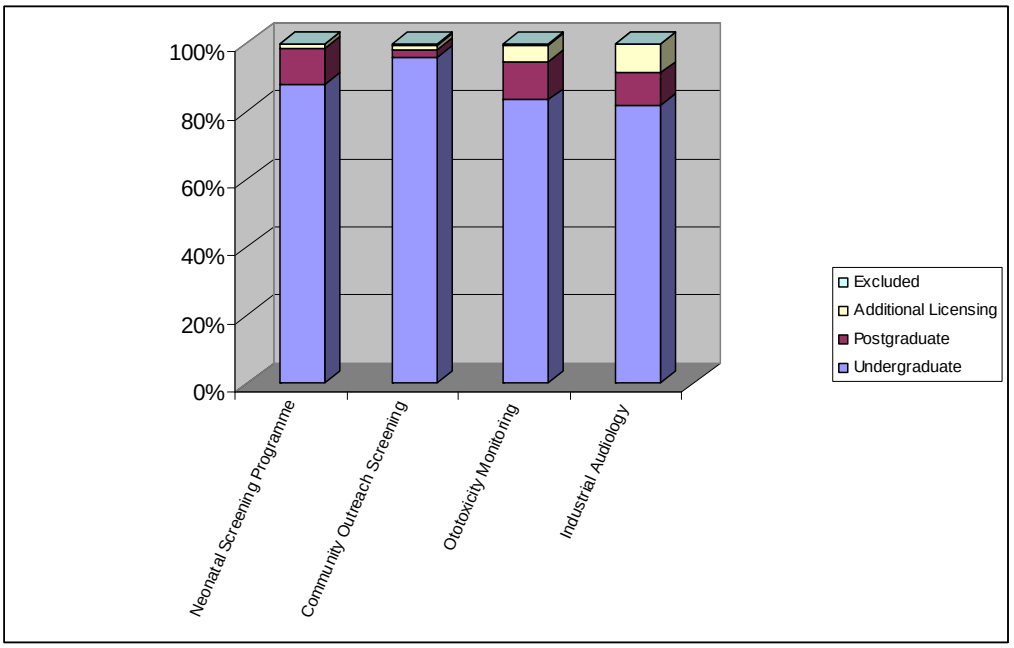

Figure 29. The level at which participants' indicated that hearing conservation and prevention should be included in the curriculum.

The majority of participants were off the opinion that neonatal screening, community outreach screening, ototoxicity monitoring and industrial audiology should all be included at an undergraduate level, as demonstrated in figure 29.

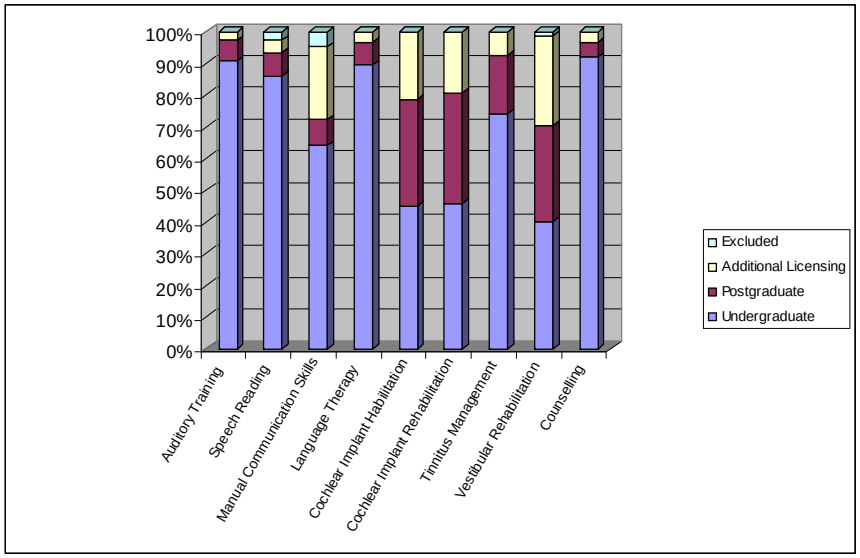

Figure 30. The level at which participants' indicated that habilitation and rehabilitation should be included in the curriculum.

The majority of participants recognized the need for all rehabilitation and habilitation to be covered at an undergraduate level, as indicated in figure 30.

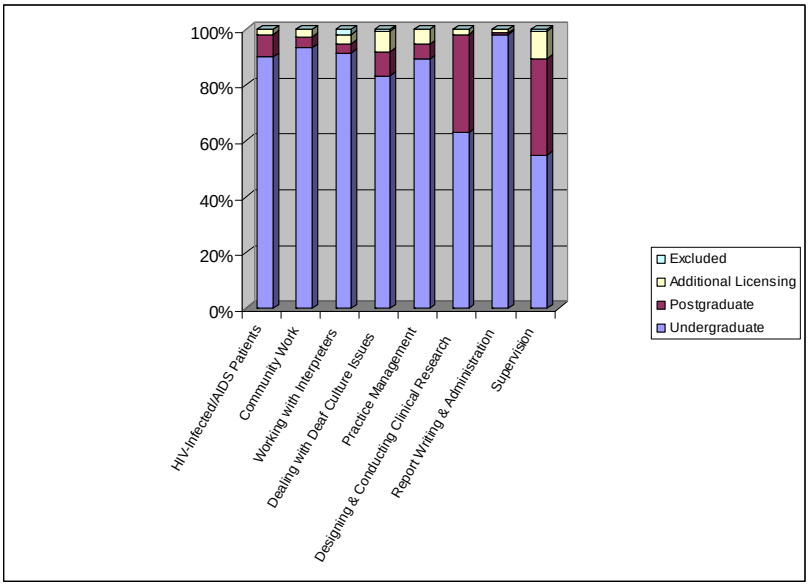

Figure 31. The level at which participants' indicated miscellaneous should be included in the curriculum.

Participants were of the opinion that all items listed under “miscellaneous” should be included at an undergraduate training level.

With the exception of the services listed in table 16, the majority of services were regarded as suitable for inclusion in an undergraduate curriculum,

Table 17. Clinical Services identified as not suitable for an undergraduate curriculum

P300	Postgraduate
Mismatch negativity (MMN)	Postgraduate
Electrocochleography ECochG	Postgraduate
Electronystagmography ENG	Postgraduate
Cochlear Implant Mapping	Postgraduate
Auditory Brainstem Implants	Postgraduate
Neurological Intraoperative Monitoring	Additional Licensing

3.1.4. Future Training Programmes

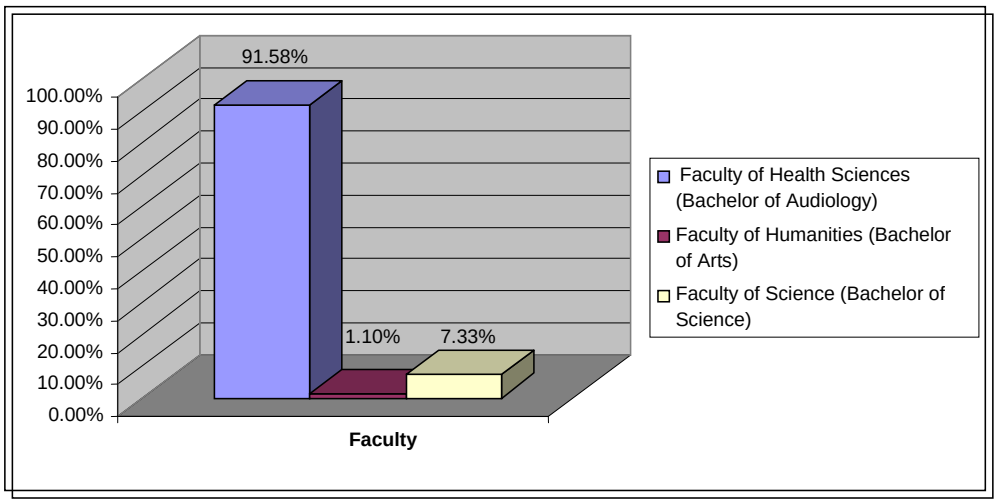

Figure 32. Faculty in which audiology programmes should be situated (*n*= 273)

The majority of respondents were of the opinion that an undergraduate degree in audiology should be situated in the Faculty of Health Sciences, as shown in figure 32. A total of 91.58% of respondents were in favour of the degree being a Bachelor of Audiology within the Faculty of Health Sciences, while 7.33% were of the opinion that it should be a Bachelor of Science degree within the Faculty of Science. 1.1% of respondents were in favour of the degree being a Bachelor of Arts within the Faculty of Humanities. The fact that the majority of respondents were in favour of a Bachelor of Audiology perhaps speaks to the need for the profession to have a recognizable identity.

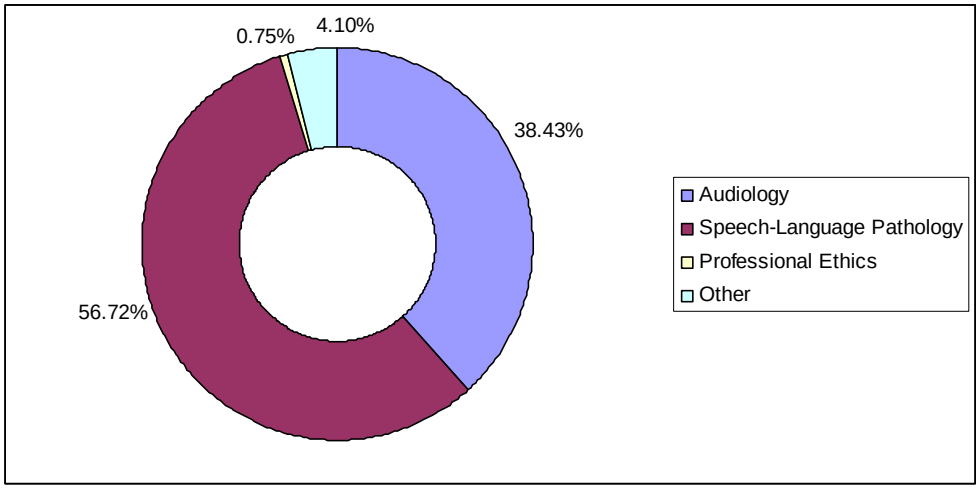

Figure 33. The research areas in which respondents completed their undergraduate reports (*n* = 268).

Figure 33 depicts the research areas in which participants completed their undergraduate research reports. The majority of respondents (56.72%) completed their undergraduate research report in the area of Speech-Language Pathology, 38.43% completed their research in Audiology, 0.75% completed their research in Professional Ethics and the remaining 4.1% listed "Other" as the topic of their research.

As indicated in figure 34, the majority of respondents (70.76%) considered a research component to be essential at an undergraduate level. A minority of 19.13% of respondents felt that research is not an essential component at an undergraduate level, while 10.11% were undecided.

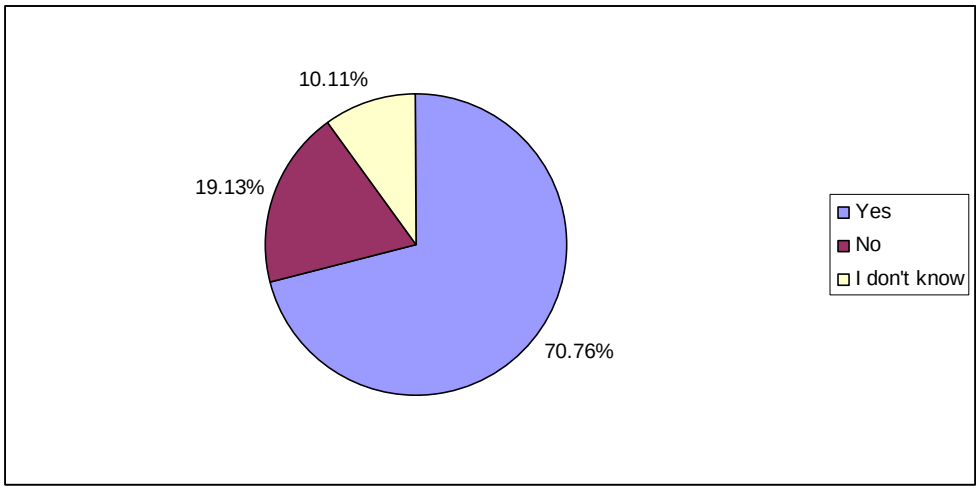

Figure 34. The importance of a research report at an undergraduate level (n = 277).

The majority of respondents (64.39%) reported that a Masters should not be the minimum entry-level into the profession. 1.08% felt that a Masters by dissertation should be the minimal entry level into the profession, 26.62% believe that a Clinical Masters should be the minimal entry level, while 7.91% felt that a Masters by Course Work and Research would be an appropriate minimal entry level. There results are depicted in figure 35. The majority of respondents are thus content with the current 4-professional undergraduate degree as the minimum entry-level into the profession.

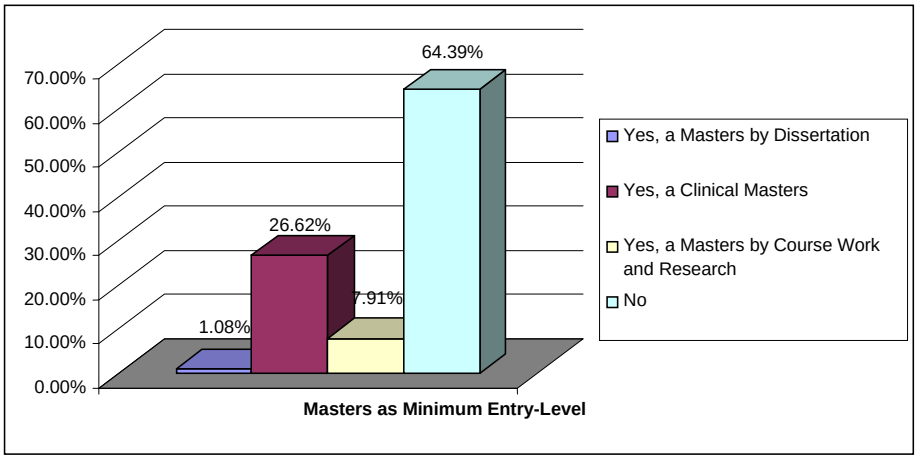

Figure 35. Participants response to the question of whether a masters degree should be the minimum entry-level into the profession of audiology (*n* = 278).

The overwhelming majority of participants (93.55%) felt that the Au.D is not appropriate to the South African context, as depicted in figure 36. Only 6.45% of respondents felt that it would be appropriate. The majority of respondents (75.36%) felt that the title of Doctor of Audiology should be reserved for those graduates who have completed a Ph.D. by thesis. These results clearly indicate that South African audiologists are not ready for a clinical doctorate in audiology and are not convinced that the title of Doctor should be applied to a clinical degree as opposed to a research degree.

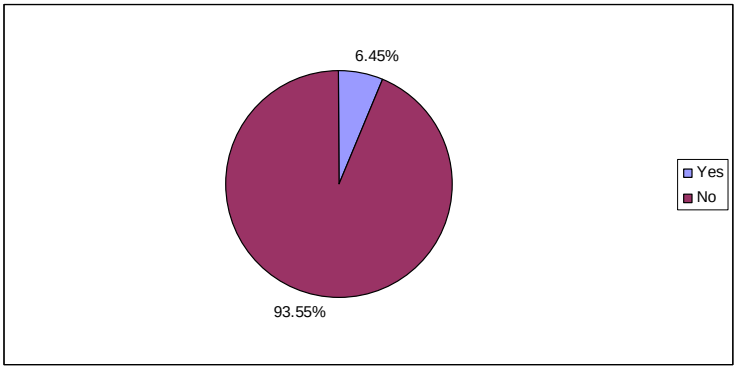

Figure 36. The response of participants to the question of whether the Au.D. Is appropriate to the South African context (*n* = 279)

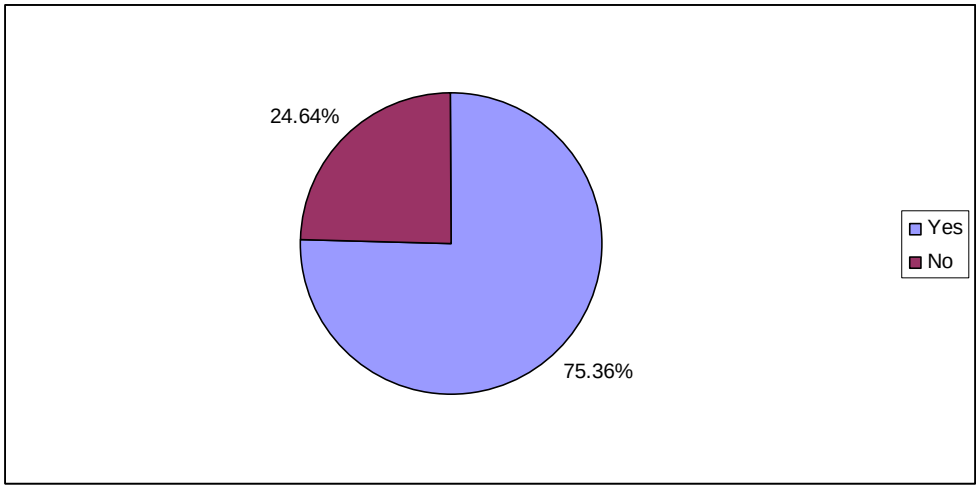

Figure 37. The attitude of respondents regarding whether HPCSA should institute a national exam for registration purposes (*n* = 277).

A majority of 70.04% of respondents were in favour of the Health Professions Council of South Africa instituting a national examination, while 29.96% were not in favour, as shown in figure 37. This would appear to suggest that the majority of respondents are in favour of establishing consistency between training programmes and ensuring that all graduates possess minimum competencies as established by a national examination.

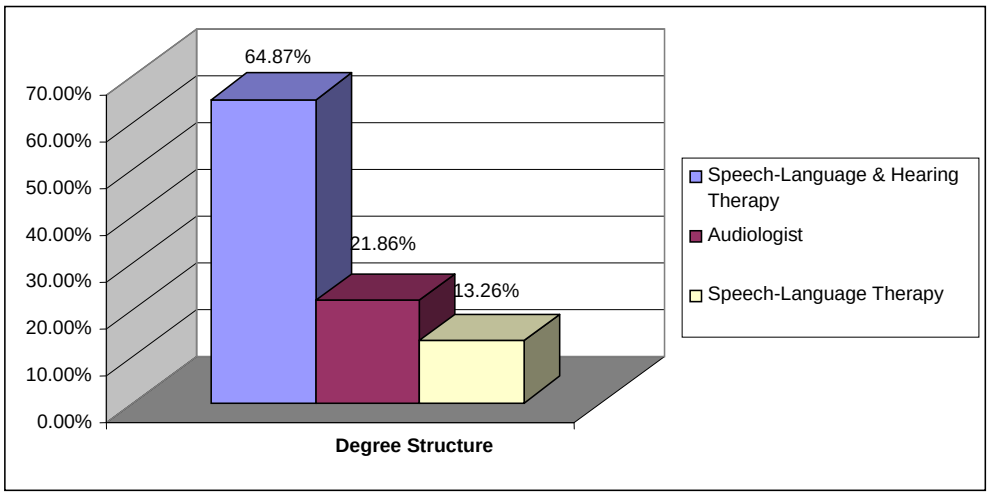

Figure 38. The degree structure that respondents would choose if they were to complete their degrees again (n = 279).

The majority of respondents (64.87%) reported that they would complete a degree in speech-language and hearing therapy that allows dual registration if they were to complete their degree again. Only 21.86% of respondents reported that they would complete a degree in Audiology and the

remaining 13.26% of participants reported that they would complete their degree in Speech Therapy, as depicted in figure 36. The respondents were thus in favour of the degree allowing dual registration which is perhaps historic given the evaluation of training programmes and the time at which most of the respondents graduate. It seems as though there is a reluctance to embrace the new split curriculums.

The results of Section F of the questionnaire which allowed respondents to provide comments has not been included since the qualitative analysis required extends beyond the scope of this report.

3.2. INFERENTIAL STATISTICS

This section of the report presents the results of average scores of the following sections of the questionnaire:

Section C: Adequacy of Theoretical and Clinical Undergraduate Training

Section D: Future Audiology Curriculum

The average scores were computed for (and hence the analysis based on) the identified themes of clinical audiological services.

Various statistical tests were carried out to assess the effect of some demographic variables on audiological services, including:

i. The effect of university on the preparedness afforded theoretically and clinically.
ii. The effect of year of graduation on the preparedness afforded theoretically and clinically.
iii. The effect of qualification in the preparedness afforded theoretically and clinically.
iv. The effect of HPCSA registration on the preparedness afforded theoretically and clinically.

Tests of association were carried out between:

i. The future audiological curriculum and qualification.
ii. The future audiological curriculum and HPCSA registration.
iii. The future audiological curriculum and primary workplace sector.

Using appropriate techniques indicated by the test of normal distribution, test statistics were computed to assess the effect of the selected demographic variables on the adequacy of theoretical and clinical undergraduate training and the future audiology curriculum

The results in this section are based on average scores and are listed in Appendix D. The decision to base results on average scores for subsystems, rather than for each area of audiology, was founded on the researcher's belief that a "broader perspective" would be more useful that a very detailed

analysis at this point. The results of the tests are reported in both graphic and tabular form. These formats are self-explanatory in many instances and only a few important points are highlighted.

Table 18. The difference in perception between theoretical and clinical undergraduate training

Table Correlation Analysis						
Clinical Variables:	**BasicC DiagnosticC PaediatricC AmplificationC HearingC HabilitationC MiscellaneousC**					
Theoretical Variables:	**BasicT DiagnosticT PaediatricT AmplificationT HearingT HabilitationT MiscellaneousT**					
Spearman Correlation Coefficients						
Prob > |r| under H0: Rho=0						
	BasicT	DiagnosticT	PaediatricT	AmplificationT	HearingT	HabilitationT
	MiscellaneousT					
BasicC						
	0.64997	0.36066	0.42158	0.36123	0.29346	0.2484
	0.26089					
	<.0001	<.0001	<.0001	<.0001	0.0003	0.0021
	0.0013					
DiagnosticC						
	0.36229	0.36196	0.42527	0.35252	0.36754	0.25414
	0.30683					
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0018
	0.0002					
PaediatricC	0.45608	0.29257	0.55324	0.37805	0.35049	0.26048
	0.27217					
	<.0001	0.0003	<.0001	<.0001	<.0001	0.0014
	0.0009					
AmplificationC	0.36255	0.27335	0.34002	0.73257	0.4583	0.29877
	0.34615					
D. Amplification - Clinical	<.0001	0.0007	<.0001	<.0001	<.0001	0.0002
	<.0001					
HearingC	0.4257	0.52848	0.52382	0.63923	0.80423	0.49869
	0.642					
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	<.0001					
HabilitationC	0.33332	0.27871	0.35011	0.45617	0.38161	0.50886
	0.43568					
	<.0001	0.0006	<.0001	<.0001	<.0001	<.0001
	<.0001					
MiscellaneousC	0.3505	0.34825	0.40219	0.48364	0.50927	0.40917
	0.51111					
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	<.0001					

Table 17 displays the results of the test of difference in perception between the theoretical and clinical undergraduate training. Since the p-values, Pr > |Z|, (for all the variables except "Miscellaneous**"**) are greater than 0.05 it can be concluded that there was no significant difference in perception between the theoretical and clinical undergraduate training in respect of the indicated

areas of audiology. This conclusion is confirmed by the results of correlation analysis. The table shows a significant relationship between all the theoretical and clinical undergraduate training variables.

Table 18. Test of Difference for Theoretical and Clinical Undergraduate Training

Two-Sample Tests - Normal Approximation		
Variable	**Z**	**Pr > |Z|**
Basic Audiology	-0.1446	0.8851
Diagnostic and Electrophysiology Tests	0.0777	0.9381
Paediatric Audiology	1.074	0.2828
Amplification	-0.0848	0.9324
Hearing Conservation and Prevention	-0.899	0.3686
Habilitation and Rehabilitation	0.0804	0.9359
Miscellaneous	**3.3192**	**0.0009 ****

Differences significant at the 5% level are indicated by **

i. The effect of university on the preparedness afforded theoretically and clinically

Table 19. Test of Difference between Universities on Preparedness

Variable		Chi-Square	DF	Pr > Chi-Square
Amplification	**Clinical**	**23.7149**	**6**	**0.0006****
	Theoretical	**15.766**	**6**	**0.0151****
Basic Audiology	Clinical	3.9002	6	0.6902
	Theoretical	4.9312	6	0.5527
Diagnostic and Electrophysiology Tests	**Clinical**	**13.1147**	**6**	**0.0413****
	Theoretical	8.7739	6	0.1867
Habilitation and Rehabilitation	**Clinical**	**17.1996**	**6**	**0.0086****
	Theoretical	**17.611**	**6**	**0.0073****
Hearing Conservation and Prevention	Clinical	11.2083	6	0.0821
	Theoretical	8.8813	6	0.1804
Miscellaneous	Clinical	9.9624	6	0.1262
	Theoretical	11.3485	6	0.0782
Paediatric Audiology	Clinical	10.8928	6	0.0917
	Theoretical	8.4948	6	0.204

Differences significant at the 5% level are indicated by **

The results in table 19 indicate that the institution at which an undergraduate degree was completed had an impact on clinical and theoretical preparation of amplification, clinical preparation of diagnostic and electrophysiology tests and the clinical and theoretical preparation of habilitation and rehabilitation.

The key shown below should be used to interpret the median scores depicted in figures 39 to 55.

KEY	
1	"Completely Unprepared"
2	"Poorly Prepared"
3	"Somewhat Unprepared"
4	"I Don't Know"
5	"Somewhat Prepared"
6	"Well Prepared"
7	"Completely Prepared".

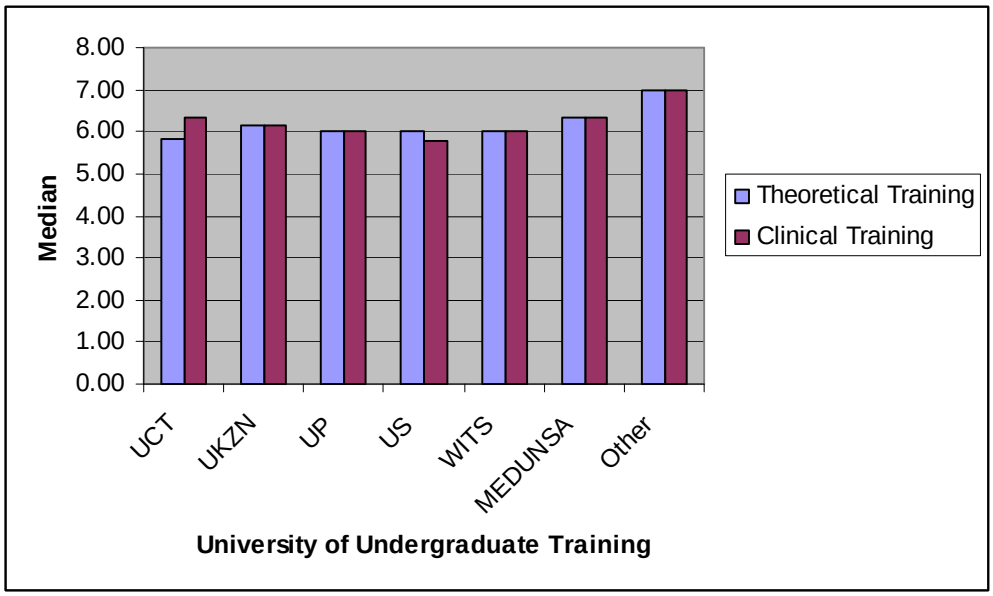

Figure 39. The effect of university on the perceived adequacy of basic audiology training.

The results depicted in figure 39 indicate that respondents across all universities considered their undergraduate training (both academic and clinical) to have prepared them to perform basic audiological tests. The South African universities were considered to have prepared respondents well, whereas respondents who studied at "other" institutions, presumably abroad, reported that their training "completely prepared" them for basic audiological testing.

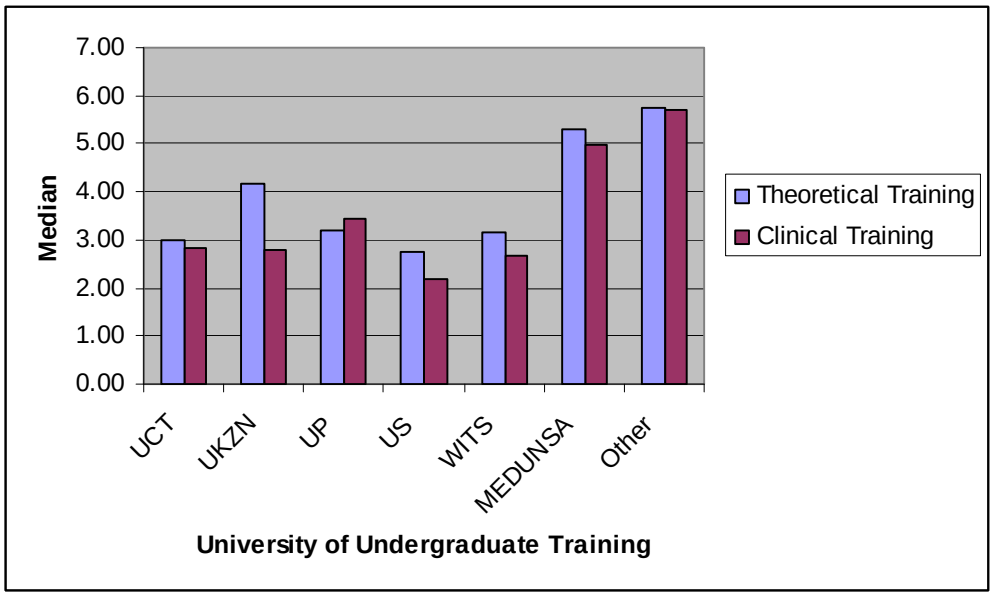

Figure 40. The Effect of University on the Perceived Adequacy of Training in Diagnostic and Electrophysiological Tests.

In terms of diagnostic and electrophysiological testing, theoretical training was generally felt to be superior to clinical training across South African universities. As depicted in figure 40, overseas training institutions and MEDUNSA appear to provide superior training based on the perceptions of respondents.

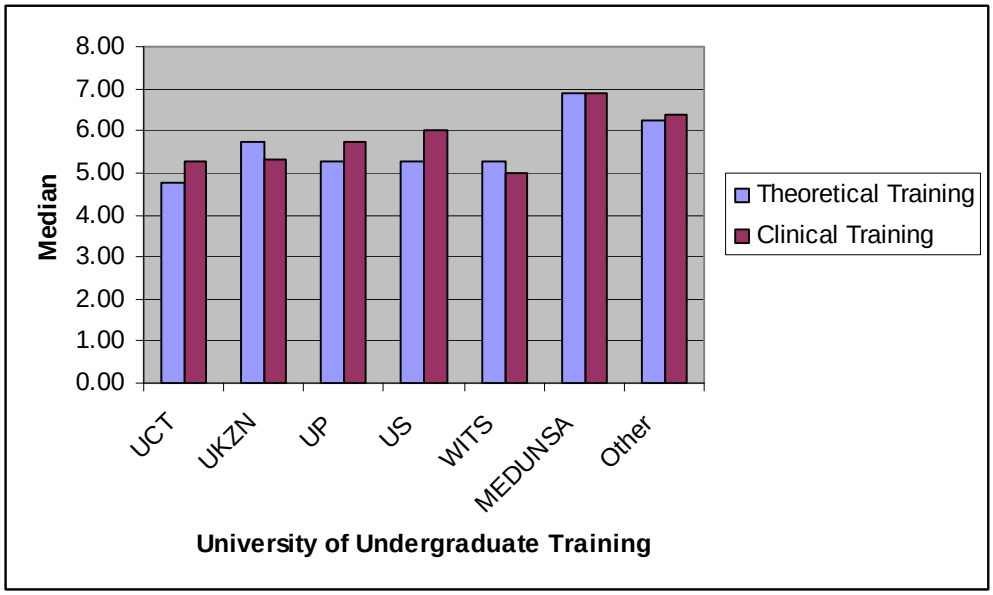

Figure 41. The effect of university on the perceived adequacy of training in paediatric audiology.

Graduates from all South African universities reported feeling at least “somewhat prepared” by their undergraduate training in paediatric audiology. Notably, Medunsa graduates reported feeling “completely prepared” to conduct paediatric hearing tests, by both their academic and clinical training.

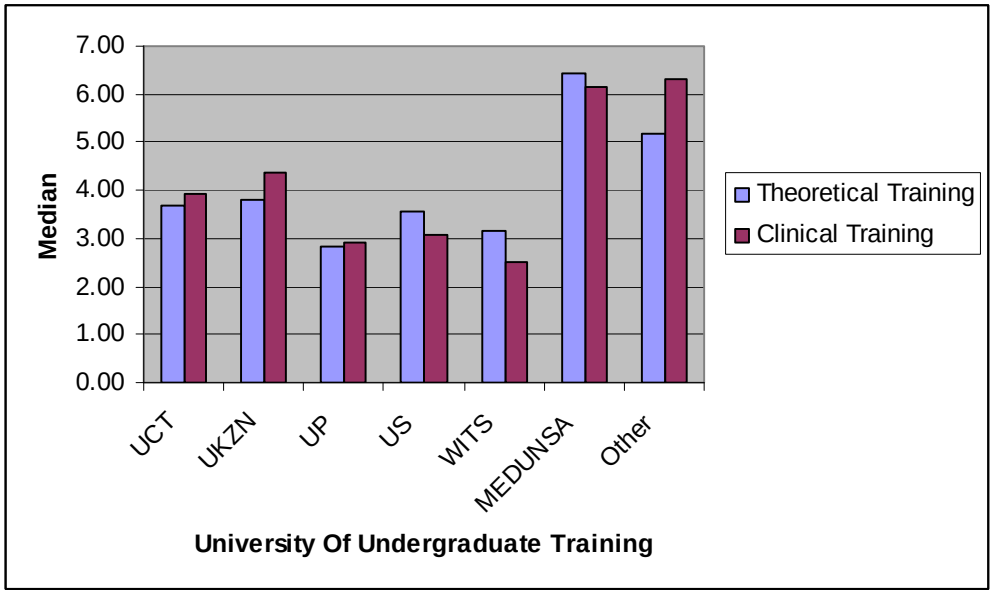

Figure 42. The effect of university on the perceived adequacy of training in amplification.

The perceived adequacy of undergraduate training in amplification is of concern. Graduates from the Universities of Pretoria (UP), Stellenbosch (US) and the Witwatersrand (WITS) reported that their academic and clinical training left them feeling “somewhat unprepared” in terms of amplification. Graduates from the Universities of Cape Town and KwaZulu-Natal were generally undecided regarding the adequacy of their undergraduate training in amplification. Only graduates from overseas institutions and MEDUNSA indicated that their training had prepared them adequately for fitting amplification, as indicated in figure 42. This may be as a result of the recency effect or of the small student numbers in the MEDUNSA course.

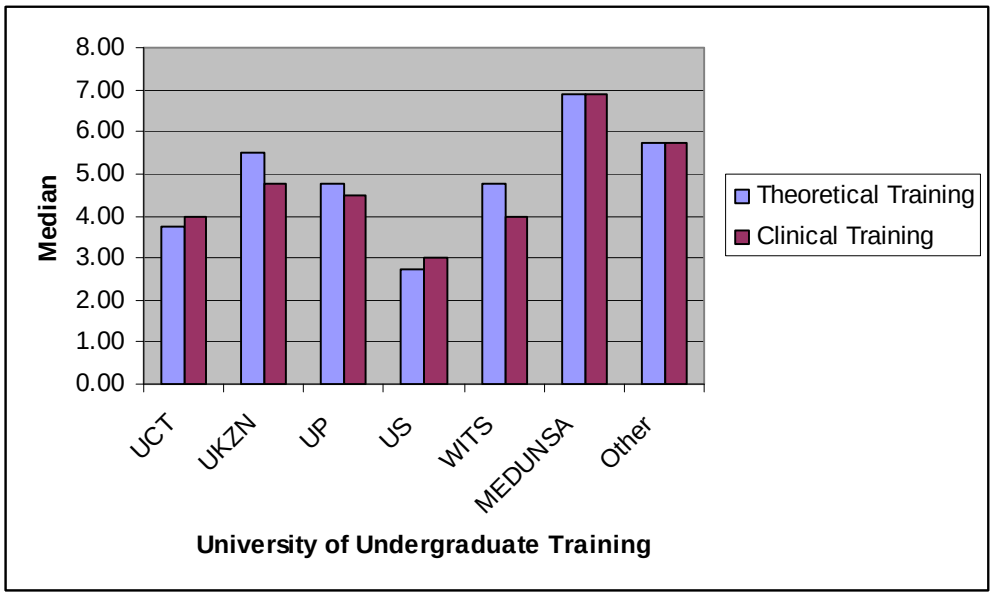

Figure 43. The effect of university on the perceived adequacy of training in hearing conservation and prevention.

Graduates of the University of Stellenbosch (US) indicated that their undergraduate training had "somewhat unprepared" them for hearing conservation and prevention. Once again, graduates from MEDUNSA indicated superior training in that they perceived their theoretical and clinical undergraduate training to have "completely prepared" them for hearing conservation and prevention services.

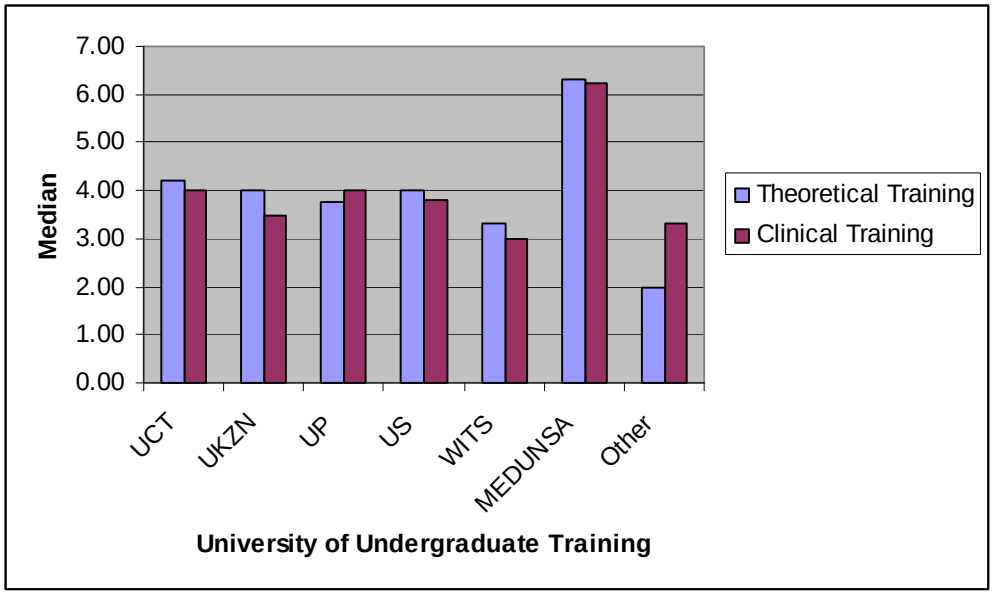

Figure 44. The effect of university on the perceived adequacy of training in rehabilitation and habilitation.

As depicted in figure 44, graduates from MEDUNSA were of the opinion that their undergraduate training had prepared them well to provide rehabilitation and habilitation services. It is interesting to note that graduates from the other South Africa universities were generally undecided regarding their undergraduate training in rehabilitation and habilitation, or felt somewhat unprepared. The graduates from "other" institutions reported being the less prepared theoretically and "somewhat unprepared" clinically.

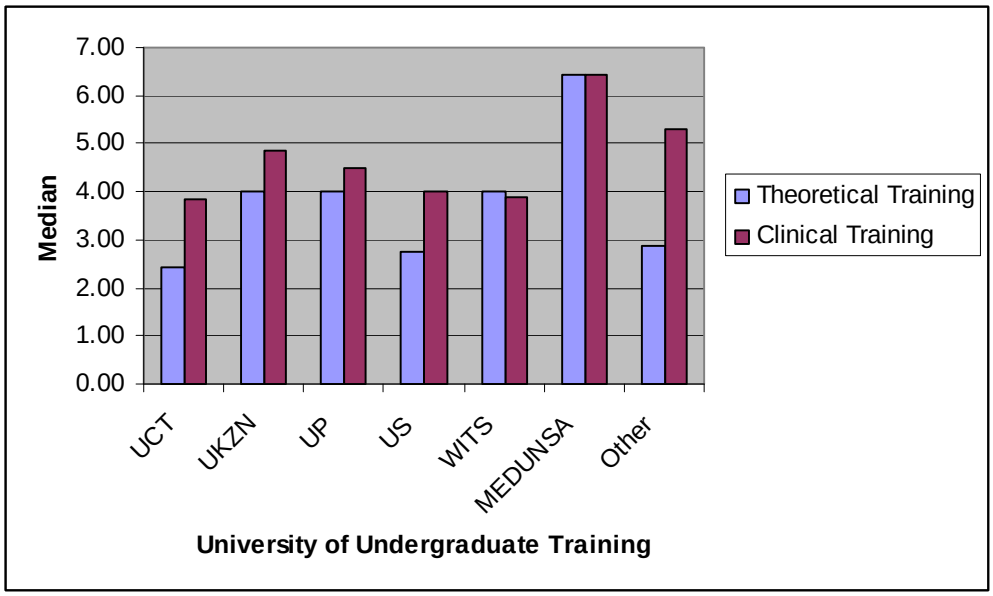

Figure 45. The effect of university on the perceived adequacy of training in miscellaneous items.

With the exception of MEDUNSA, graduates from South African universities generally reported being undecided or feeling unprepared for the clinical services listed under the theme of "Miscellaneous". Graduates from the Universities of Cape Town (UCT), Stellenbosch (US) and "other" intuitions felt the least prepared academically. Graduates from the Universities of Cape Town (UCT), Stellenbosch (US) and the Witwatersrand (WITS) all felt undecided regarding their clinical training. Once again, MEDUNSA students felt "well prepared" by both their theoretical and clinical training.

ii. The effect of year of graduation on the preparedness afforded theoretically and clinically

The year of graduation had a significant impact on the level of preparedness afforded theoretically and clinically by undergraduate training, as depicted in table 20.

Table 20. Test of Difference between Years of Graduation on Preparedness

Variable		Chi-Square	DF	Pr > Chi-Square
Amplification	Clinical	7.3652	3	0.0611
	Theoretical	32.4457	3	<.0001**
Basic Audiology	Clinical	3.0975	3	0.3768
	Theoretical	10.9136	3	0.0122**
Diagnostic and Electrophysiology Tests	Clinical	6.1006	3	0.1068
	Theoretical	36.5874	3	<.0001**
Habilitation and Rehabilitation	Clinical	16.1944	3	0.001**
	Theoretical	35.4142	3	<.0001**
Hearing Conservation and Prevention	Clinical	21.4114	3	<.0001**
	Theoretical	32.5591	3	<.0001**
Miscellaneous	Clinical	13.9302	3	0.003**
	Theoretical	52.3629	3	<.0001**
Paediatric Audiology	Clinical	0.5262	3	0.9131
	Theoretical	5.7598	3	0.1239

Differences significant at the 5% level are indicated by *

Respondents who graduated in 2001 or later perceived their training (theoretical in particular) to prepare them better than those who had graduated prior to 2001, as depicted in figure 46. This is possibly related to the fact that the split curriculum was introduced at some institutions in 1999.

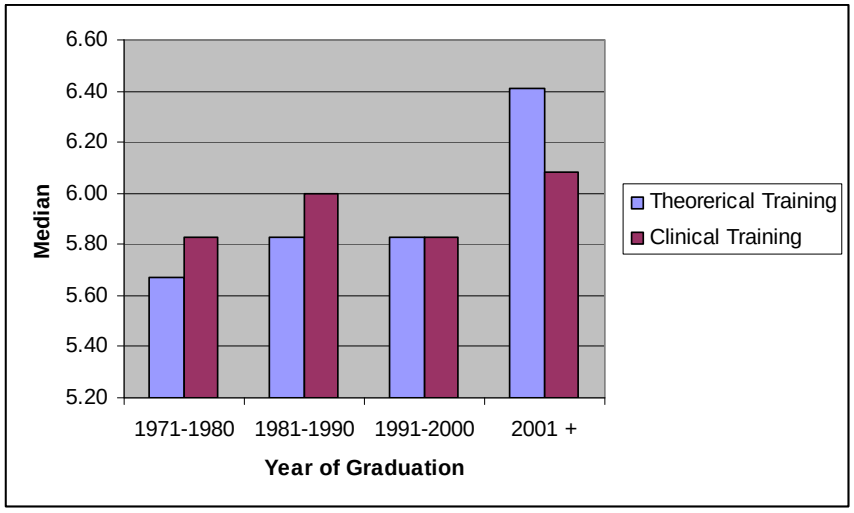

Figure 46. The effect of year of graduation on the perceived adequacy of training in basic audiology.

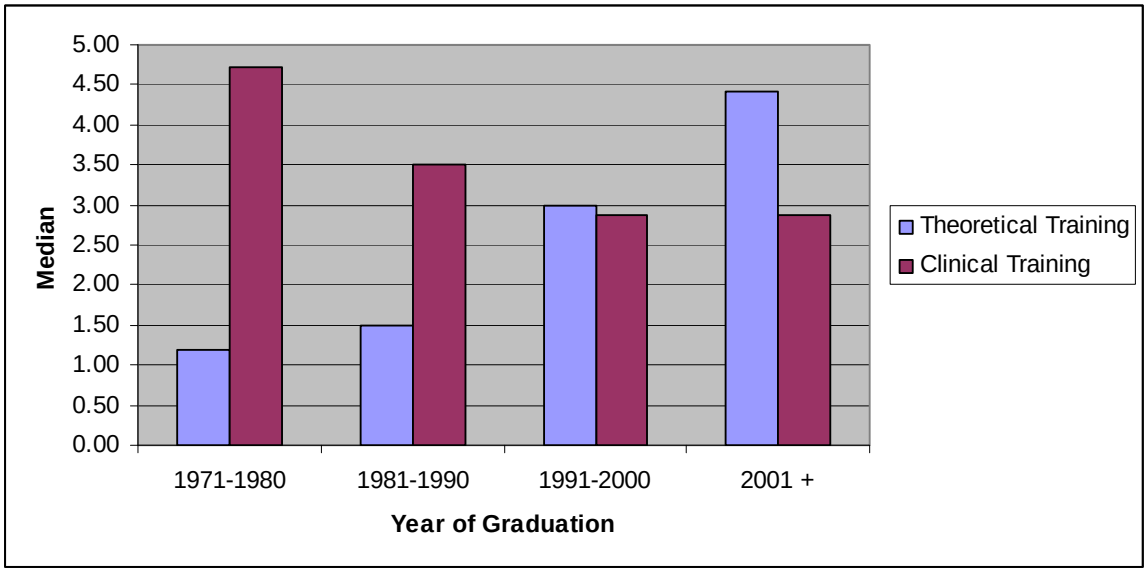

Figure 47. The effect of year of graduation on the perceived adequacy of training in diagnostic and electrophysiological tests.

Figure 47 indicates that there is a large discrepancy between the perceived adequacy of both theoretical and clinical training in diagnostic and electrophysiological tests by year of graduation. The trend generally shows that the perceived adequacy of theoretical training in diagnostic in electrophysiological tests has improved over the years. This is most likely explained by the fact that the field of diagnostic audiology has burgeoned with an increase in technology available for testing In contrast, the adequacy of clinical training in this area appears to have declined and reached a plateau. This can once again be explained by the fact that in more recent years, there have been more tests that students need to learn to perform clinically.

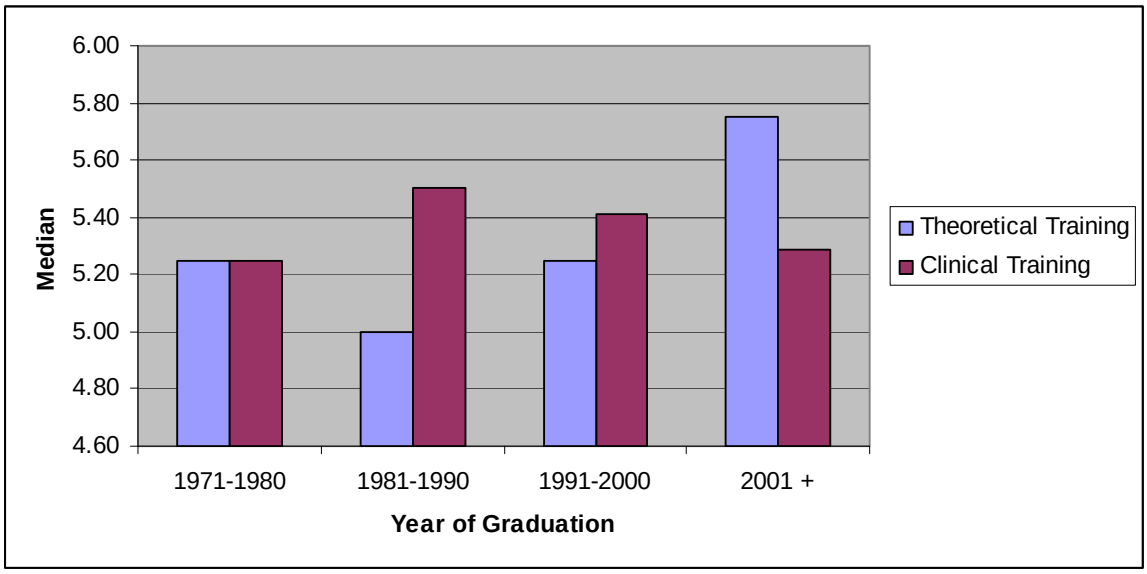

Figure 48. The effect of year of graduation on the perceived adequacy of training in paediatric audiology.

The adequacy of undergraduate training in paediatric audiology appears to have remained constant despite the year of graduation of the respondents, as indicated by the results shown in figure 48.

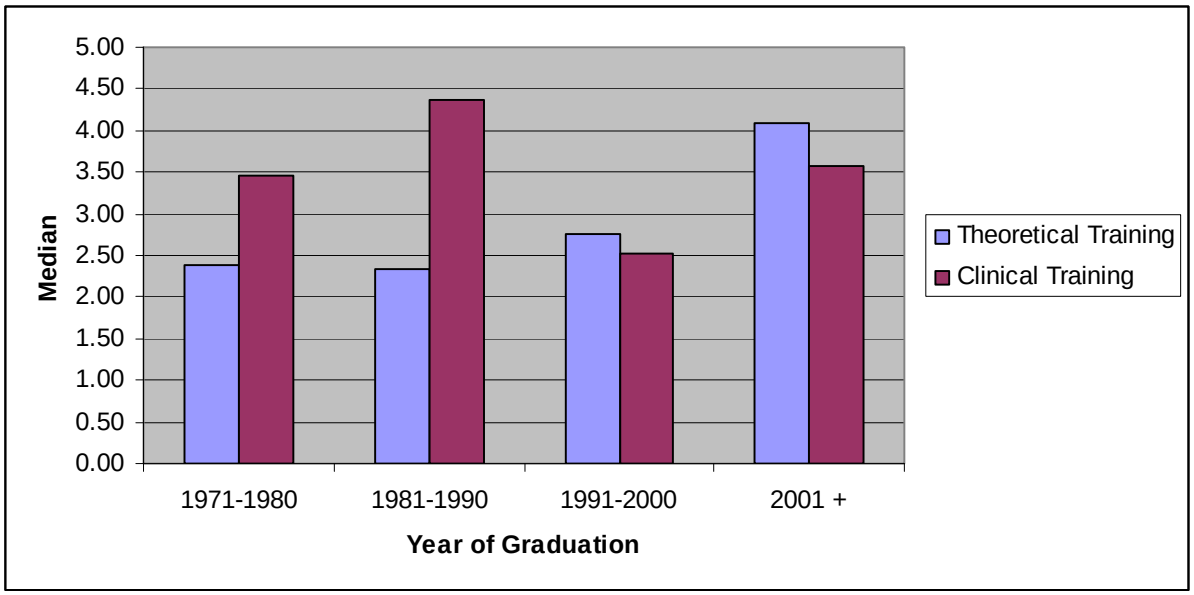

Figure 49. The effect of year of graduation on the perceived adequacy of training in amplification.

Respondents who graduate prior to 2001 generally reported their theoretical preparation to be poor. Those who graduated in 2001 or later were undecided regarding the adequacy of undergraduate theoretical training in amplification. It seems that clinical training has fluctuated in terms of perceived adequacy, but that the general trend is that graduates from all years of study felt unprepared by their

clinical training.

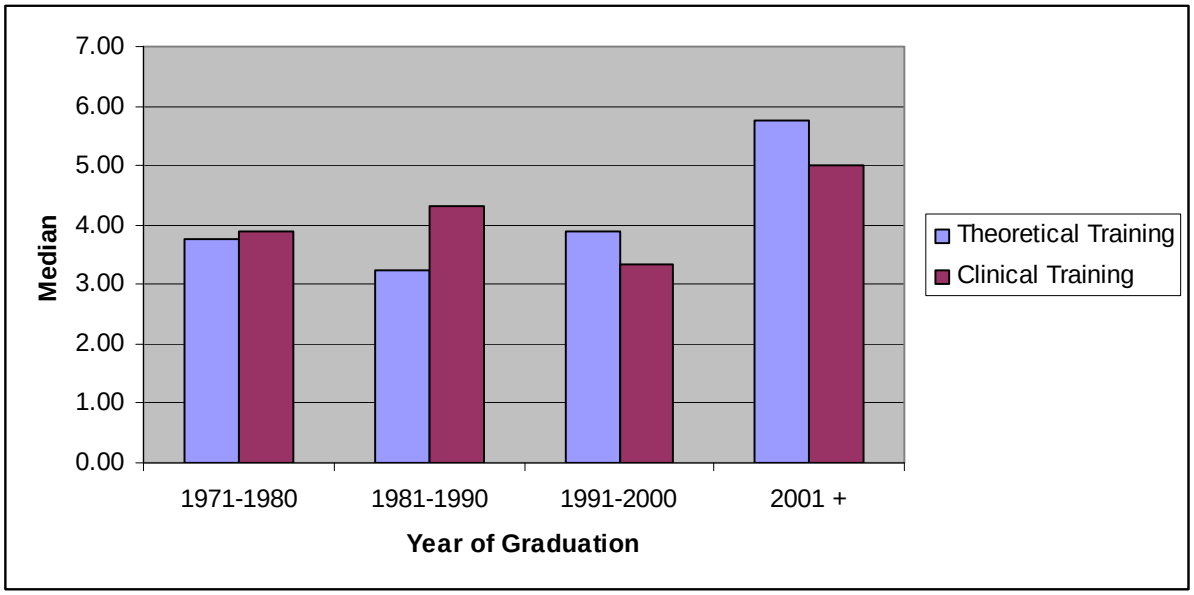

Figure 50. The effect of year of graduation on the perceived adequacy of training in hearing conservation and prevention.

As indicated in figure 50, there has been an improvement in the perceived adequacy of both clinical and theoretical training in hearing conservation and prevention by those respondents who graduated in 2001 or later. Participants who graduated prior to 2001 either felt undecided or "somewhat unprepared" in this area. This is possibly related to the fact that the scope of practice has grown in this area to included neonatal screening and ototoxicity monitoring over recent years.

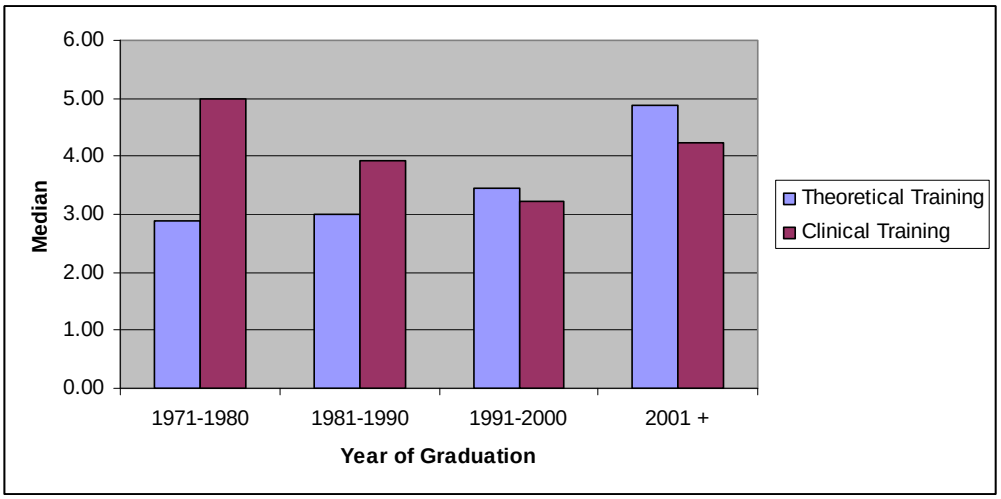

Figure 51. The effect of year of graduation on the perceived adequacy of training in rehabilitation and habilitation.

Respondents who graduate prior to 2001 generally indicated that they felt “somewhat unprepared” by their theoretical training in rehabilitation and habilitation. In contrast, as depicted in figure 51, participants who had graduated in 2001 or later felt “somewhat prepared” by their theoretical training. Participants who had graduated prior to 1980 felt “somewhat prepared” on contrast those who had graduated after 1980 and felt either undecided or “somewhat unprepared”.

Figure 52 shows that there has been an increase in the perceived adequacy of theoretical undergraduate training in miscellaneous items.

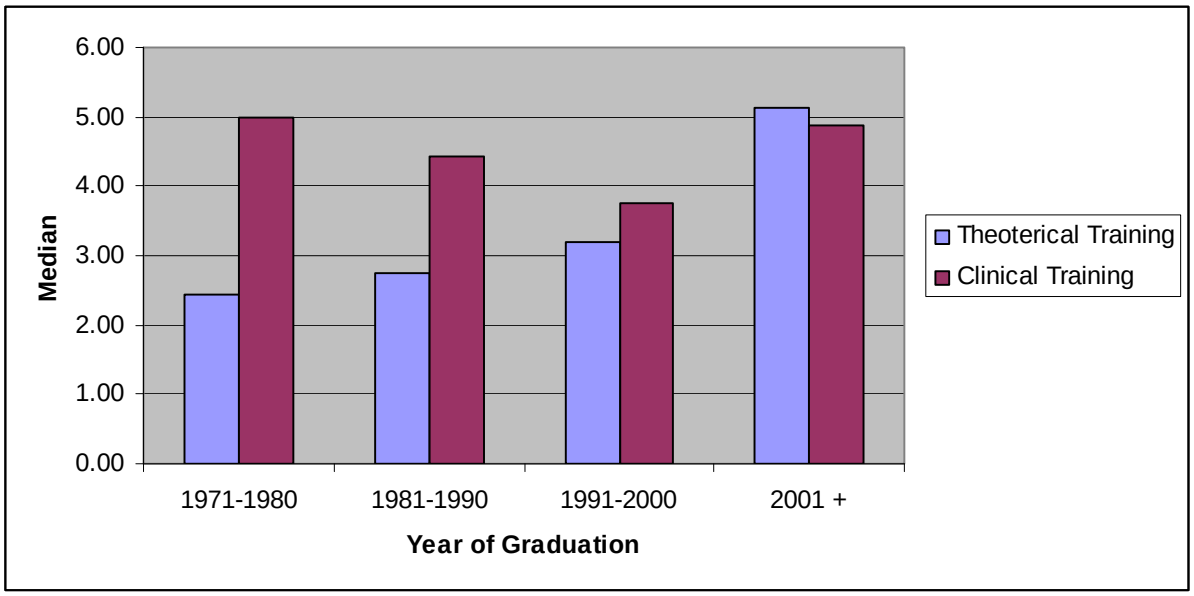

Figure 52. The effect of year of graduation on the perceived adequacy of training in miscellaneous items.

iii. The effect of qualification in the preparedness afforded theoretically and clinically.

The respondent’s level of qualification only had a significant impact on the theoretical preparation of hearing conservation and prevention, as indicated by tables 21 and 22. The reason for this is unclear.

Table 21. Test of Difference between levels of qualification on Preparedness – Theoretical Training

Two-Sample Tests		
Variable	**Z**	**Pr > |Z|**
Basic Audiology	-1.1133	0.2656
Diagnostic and Electrophysiology Tests	-1.5152	0.1297
Paediatric Audiology	0.2197	0.8261
Amplification	-1.5317	0.1256
Hearing Conservation and Prevention	-2.1614	0.0307 **
Habilitation and Rehabilitation	-1.5207	0.1283
Miscellaneous	-1.8731	0.0611

Differences significant at the 5% level are indicated by *

Table 22: Test of Difference between levels of qualification on Preparedness – Clinical Training

Two-Sample Tests		
Variable	Z	Pr > |Z|
Basic Audiology	0.2978	0.7658
Diagnostic and Electrophysiology Tests	0.0777	0.9381
Paediatric Audiology	0.95	0.3421
Amplification	0.5228	0.6011
Hearing Conservation and Prevention	-1.298	0.1943
Habilitation and Rehabilitation	0.5676	0.5703
Miscellaneous	1.0887	0.2763

Differences significant at the 5% level are indicated by **

iv. The effect of HPCSA registration on the preparedness afforded theoretically and clinically

The results in table 23 indicated that registration with the HPCSA has an effect on the theoretical preparedness of diagnostic and electrophysiological tests, paediatric audiology and hearing conservation and prevention and miscellaneous items. This is perhaps as a result of the split curriculum.

Table 23. Test of effect of those registered with HPCSA on preparedness – theoretical training

Two-Sample Tests		
Variable	**Z**	**Pr > |Z|**
Basic Audiology	1.5302	0.126
Diagnostic and Electrophysiology Tests	2.3361	0.0195**
Paediatric Audiology	1.8094	0.0704**
Amplification	1.594	0.1109
Hearing Conservation and Prevention	2.9436	0.0032**
Habilitation and Rehabilitation	1.6098	0.1074
Miscellaneous	2.8119	0.0049**

Differences significant at the 5% level are indicated by **

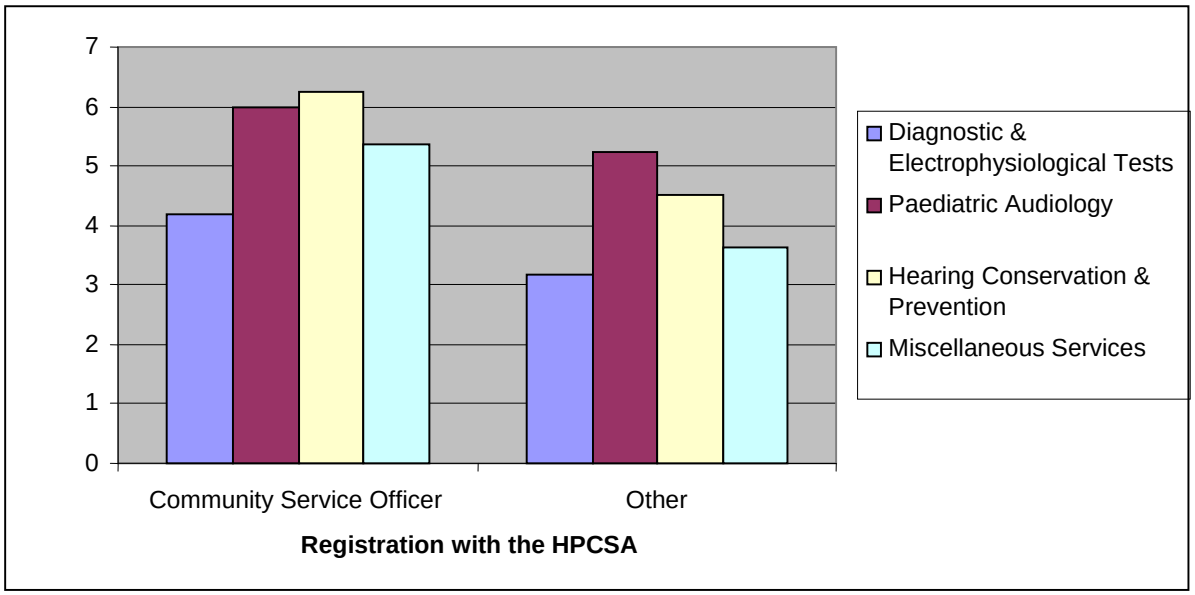

Figure 53. The effect of registration with the HPCSA on the adequacy of undergraduate theoretical training.

As indicated by the results shown in figure 53, community service officers generally perceived their academic training in diagnostic and electrophysiological test, paediatric audiology, hearing conservation and prevention and the services listed under "miscellaneous" to have prepared them more adequately than respondents registered as speech-language therapists, audiologists or speech-language therapists and audiologists. This may be attributed to the recency effect.

Registration with the HPCSA has an effect on the clinical preparedness hearing conservation and prevention, as indicated by the results in table 24.

Table 24. Test of effect of those registered with HPCSA on preparedness – clinical training

Two-Sample Tests		
Variable	Z	Pr > |Z|
Basic Audiology	1.2185	0.223
Diagnostic and Electrophysiology Tests	0.208	0.8352
Paediatric Audiology	0.3339	0.7384
Amplification	0.0000	1.0000
Hearing Conservation and Prevention	2.5819	0.0098**
Habilitation and Rehabilitation	1.4151	0.1571
Miscellaneous	1.5567	0.1195

Differences significant at the 5% level are indicated by *

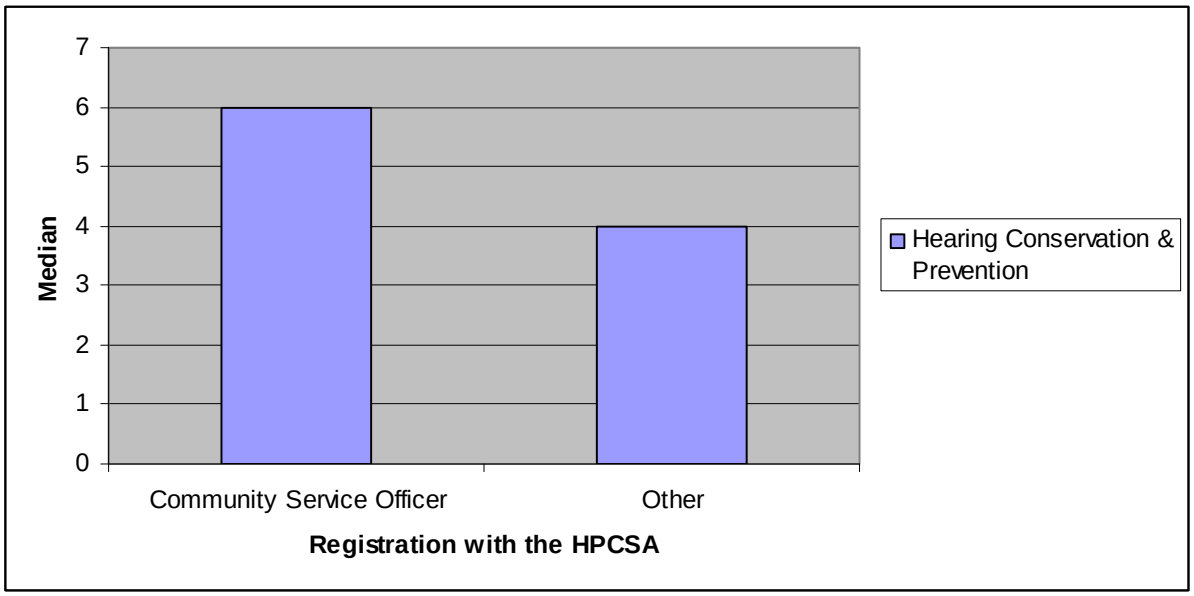

Figure 54. The effect of registration with the HPCSA on the adequacy of undergraduate clinical training.

As shown by the graph in figure 54, community services officers were of the opinion that their clinical training had prepared them well for hearing conservation and prevention. This is in contrast to respondents registered as speech-language therapists, audiologists or speech-language therapists and audiologists who felt undecided. This may be attributed to the fact that the purpose of community service posts is largely community outreach which often involves some form of hearing conservation or prevention.

i. The future audiological curriculum and qualification.

A Fisher's Exact Test of association indicated that no association existed between respondents' qualifications and the future audiology curriculum that was preferred.

Table 25. Test of Association between Future Audiology Curriculum and Qualification

Fisher's Exact Test		
Variable	**Table Probability (P)**	**Pr <= P**
Amplification	0.0791	0.6611
Basic Audiology	0.3236	0.5968
Diagnostic and Electrophysiology Tests	0.0165	0.2229
Habilitation and Rehabilitation	0.1311	1.0000
Hearing Conservation and Prevention	0.1421	0.6598
Miscellaneous	0.1174	0.3184
Paediatric Audiology	0.2199	0.7176

ii. The future audiological curriculum and HPCSA registration.

A Fisher's Exact Test of association indicated that no association existed between respondents' registration with the HPCSA and the future audiology curriculum that was preferred.

Table26. Test of Association between Future Audiology Curriculum and Registered (with HPCSA).

Fisher's Exact Test		
Variable	**Table Probability (P)**	**Pr <=**
P		
Amplification	0.0652	
	0.2842	
Basic Audiology	0.6317	
	1.0000	
Diagnostic and Electrophysiology Tests	0.153	
	1.0000	
Habilitation and Rehabilitation	0.1739	
	0.5126	
Hearing Conservation and Prevention	0.3368	
	1.0000	
Miscellaneous	0.2468	
	0.3519	
Paediatric Audiology	0.6317	
	1.0000	

iii. The future audiological curriculum and primary workplace sector.

Fisher's Exact Test of Association showed an association between the primary workplace sector and the placement of habilitation and rehabilitation services within the future curriculum. These results are depicted in table 27. As indicated in figure 55, the majority those working in the public sector (74.67%) would prefer habilitation and rehabilitation to be included in the undergraduate curriculum, while only 53.33% of those working in the private sector were of the opinion that it should be included in the undergraduate curriculum. This may be due to the fact the aural rehabilitation or habilitation is more likely to be provided in state institutions than in private practice.

Table27. Test of Association between Future Audiology Curriculum and Workplace (Sector)

Fisher's Exact Test		
Variable	**Table Probability (P)**	**Pr <=**
P		
Amplification	0.0181	
	0.3029	
Basic Audiology	0.0596	
	0.0934	
Diagnostic and Electrophysiology Tests	0.0239	
	0.8018	
Habilitation and Rehabilitation	0.0015	
	0.013**	
Hearing Conservation and Prevention	0.0655	
	0.7733	
Miscellaneous	0.0171	
	0.0508	
Paediatric Audiology	0.0128	
	0.0627	

Differences significant at the 5% level are indicated by *

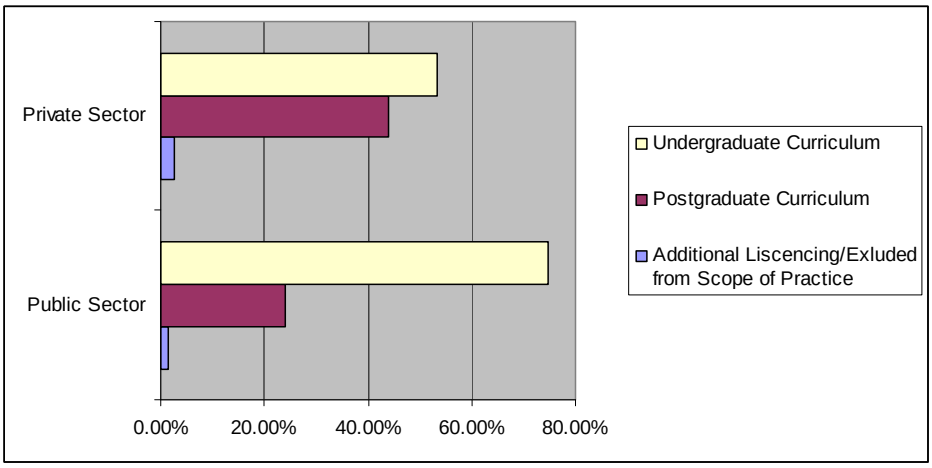

Figure 55. Placement of rehabilitation and habilitation services within the curriculum as a function of primary workplace of participants

CHAPTER FOUR

This chapter offers an interpretation of the results documented in chapter three. The chapter begins with a detailed interpretation of the sample as this has a direct impact on the interpretation of the results of the study. Through discussion of the results, the researcher aims to stimulate debate, propose possible resolutions and offer suggestions for future research.

4. DISCUSSION

4.1. Sample Characteristics

According to Rosenfeld and Tannenbaum (2000), 18.93% is a low response rate, even for a mailed survey and as a result the sample may be biased. However, 284 responses provide a sufficient sample for the application of both descriptive and inferential statistics. Furthermore, if one considers that the current number of speech, language and health professionals registered with the HPCSA is 1762 (HPCSA, 2007), the response rate represents 16.12% of the target population. This figure may in fact be even higher given that speech-language therapists and audiologists represent only a portion of the categories eligible for listing on the speech, language and hearing professions register.

The poor response rate of 18.93% can be attributed to a number of factors. The most obvious factor is perhaps the length of the questionnaire itself. Given the cost of printing the forms, it was felt that the questionnaire had to be as comprehensive as possible in order to facilitate investigation of both service delivery and educational issues. The decision to use the six-page questionnaire was based on a study by Hoffman et al (cited in Bowling 2002) who reported similar response rates for a 4-page and 16-page health questionnaire, suggesting that once a questionnaire exceeds 4 pages, length may not have an impact on response rate. The cost of printing further prevented the mailing of reminders and a decision was made to remind respondents through the South Africa Association of Audiologist (SAAA) and the South Africa Speech-Language and Hearing Association (SASLHA), in addition to Provincial Forums to reach those employed in the public sector. A disadvantage of this approach is that not all potential respondents were members of SAAA or SASLHA and not all potential respondents would have been reached through Provincial Forums.

The researcher also hypothesized that many potential respondents did not receive the survey questionnaire due to incorrect addresses or due the fact that they are working overseas.

It is interesting to note that number of responses varied from question to question, even in section, A which is concerned with basic biographical information. This may be attributed to the layout of the questionnaire.

The overwhelming majority of respondents (97.17%) were female and only 2.83% male. Studies by Tannenbaum and Rosenfeld (2000) and Brodsky and Cooke (2000) showed the same gender dominance. The domince of female graduates is thus reflective of the current state of the profession in South Africa and in the United States.

There is a growing concern in the profession at large that the shrinking number of males entering the field may not be good for the profession (Nemes, 2005). One difficulty in attracting males into the profession is that the vast majority of students who hear about audiology as a profession are those already studying speech and hearing science, which is typically female dominated.

Rogoff (cited in Doyle and Freeman, 2002) conducted a study of medical students in 1957 and found that the earlier a student is drawn to a medical career, the less likely it is that he/she will consider doing anything else. Over half of the students surveyed by Rogoff reported first thinking of medicine as a career before the age of 14. According to Doyle and Freeman (2002), audiology students are deciding to enter the profession later in life and almost all of them have seriously considered numerous other professions. Results of their survey showed that 90% of students first thought of audiology after the age of 18 and almost all students (92%) indicated that they had considered studying other occupations. Interestingly, the survey revealed that students ranked audiology as having the lowest perceived importance of a list of professions that included medicine, law, dentistry, optometry, teaching, psychology, nursing, engineering and pharmacology. Audiology seems to have a very low profile and associated low status as a profession. If we are to attract males into the profession, it seems that raising the visibility of audiology as a profession is an important start. Targeting high school learners and educating them regarding the profession is also important given the results of Rogoff's study.

Some believe that the movement towards an Au.D. in the United States will already attract more men into the field, as it will increase earning capacity through increased autonomy (Doyle & Freeman, 2002). In South Africa, where the minimum entry level into the profession is an undergraduate degree, it seems unlikely that the mere introduction of audiology undergraduate

degrees will increase the number of males interested in the profession.

Brodsky and Cooke (2000) found that personal and employment factors were significant in influencing students to pursue audiology. The main influential personal factors for students studying audiology included the desire to work in a helping profession, the desire to work with people and a diversity of professional work settings. Employment factors included job availability, job security and opportunities for professional advancement. Clearly these factors should be addressed in any marketing campaign aimed at recruiting students into the profession.

The majority of participants (84%) indicated that they held an undergraduate degree. This is to be expected, given the fact that an undergraduate degree is the minimum entry-level into the profession in South Africa. Interestingly, a similar number of respondents held a Masters by coursework and Masters by dissertation. A total of 5.09% of respondents held a Masters by coursework, while 5.82 % held a Masters by dissertation. Only 2.55 % of respondents held a research PhD. This is of concern given that science-based professions such as audiology require research base from which new diagnostic and therapeutic knowledge can originate (ASHA, 1994). The remaining 2.55% of respondents held a diploma in Community Speech and Hearing Work. The distribution of qualifications is felt to be reflective of the status of the profession in South Africa, where the majority of communication specialists are content with the minimum undergraduate entry-level into the profession and postgraduate qualifications are generally not related to income-generating capacity.

The question regarding year of undergraduate graduation was poorly answered, possibly due to the layout of the date format. This was disappointing, as the structure of the date had not emerged as problematic in the pilot study. Perhaps this could have been overcome by providing an example of how to complete the date. The sample included audiologists who had graduated in the 1960's, 70's, 80's, 90's as well as those who graduated in 2000, 2001, 2002, 2003, 2004 and 2005 as reflected in table 28. The majority of students graduated in the 1990s. The distribution of respondents is important to consider when interpreting results as many diagnostic procedures such as ABR and OAE were not included in routine clinical practice in South Africa until the late 1990's.

Table 28. Distribution of respondents by year of graduation of undergraduate degree

Period/year of graduation	Number	Percentage
1950 to1959	1	0.39
1960 to 1969	5	1.97
1970 to 1979	30	11.81
1980 to 1989	47	18.50
1990 to 1999	79	31.10
2000	15	5.91
2001	7	2.76
2002	18	7.09
2003	21	8.27
2004	28	11.02
2005	3	1.18

All universities were represented in the survey, with the University of Pretoria having a 45.04% majority. The dominance of respondents from the Universities of Pretoria and the Witwatersrand is possibly due to the fact that the departments are the oldest and have therefore produced more graduates. Student intake at the various universities should also be considered as the Universities of Pretoria and the Witwatersrand accept more students than smaller departments such as the University of KwaZulu-Natal. The University of Pretoria currently has the largest research output in the field of communication disorders and hence the emphasis on and the culture of research may have influenced graduates to participate in research (Ramma, 2006)

Only 23.12% of respondents indicated that they hold a postgraduate qualification. The sample indicated that the majority of postgraduate degrees (29) were obtained from the University of Pretoria. Seven respondents reported having obtained a postgraduate degree from the University of the Witwatersrand, while two obtained their degree from the University of Stellenbosch. Within the sample, only one person obtained a postgraduate degree from the University of Cape Town and only one person obtained a postgraduate degree from the University of KwaZulu-Natal. The remaining six postgraduate degrees labeled from “other” institutions are most likely overseas institutions. Once again, the distribution of postgraduate qualifications may be attributed to the fact that the Universities of Pretoria and the Witwatersrand have the most established postgraduate programmes.

The question regarding qualification was poorly answered, perhaps due to the use of deliberate, but confusing terminology. The term “Speech and Hearing Therapist” was coined to denote the four-year professional degree allowing registration on both the register for Speech –Language Therapists and Audiologists. The poor response to this question is reflected in the fact that only 47 respondents replied. Interestingly, 46.81% of respondents considered themselves to have qualified as Audiologists, 38.30% considered themselves to be qualified as Speech Therapists and only 14.89% considered themselves to be speech language and hearing therapists. Of particular interest is the fact that participants were not requested to restrict their answer to one choice. This means that respondents were free to select both audiologist and speech language therapist as a response. It seems that the majority of graduates, despite being eligible for dual registration, closely identify with either the profession of audiology or the profession of speech therapy. The clear identity that respondents have in terms of the profession is interesting given that the majority indicated that they would chose to study speech and hearing therapy if they were to decide on a degree structure again. Respondents thus want to have training in both professions, but are likely to only pursue one as a career.

In terms of registration with the HPCSA, 8% reported being registered as audiologists, 11.60% reported being registered as speech language therapists and interestingly 75% reported being registered as speech language and hearing therapists. This is interesting in that no such category exists on the HPCSA register and respondents were allowed to respond to more than one choice. 10% of the sample indicated that they are Community Service Officers, while 2.4% of the sample is registered as Community Speech and Hearing Workers. It seems that in the case of registration, the term “speech and hearing therapist” was interpreted as being synonymous with dual registration on both the speech-language therapy and audiology registers. This is in contrast to the question regarding qualification, where most respondents considered themselves to have qualified as either speech therapists or audiologists.

In terms of current practice, a majority of 41.45% indicated that they are practicing as speech language therapists. A total of 29.82% indicated that they are practicing as speech language and hearing therapists and 20% indicated that they are practicing as audiologists. 3.27% percent indicated that they are practicing as Community Speech and Hearing Workers and 5.45% indicated that they were not practicing the profession. Although the majority of respondents regard themselves as being registered as speech and hearing therapists, most of those registered as speech and hearing therapists appear to be working exclusively as speech-

language therapists. It is interesting to note that only 20% of the respondents are practicing exclusively as audiologists. Table 29 shows the distribution of respondents as a function of registration with the HPCSA and their current occupation.

Table 29. The distribution of respondents as a function of registration with the HPCSA and current occupation practiced.

	Audiologist	Speech Language Therapist	Speech-Language & Hearing Therapist	Community Speech and Hearing Worker	Community Service Officer	None of the above
Registration with HPCSA	20	29	185	6	10	0
Currently practicing as	55	114	82	9	0	15

The sample was fairly evenly spread between the public and private employments sectors, with 47.79% of respondents indicating that they are employed in the public sector and 52.21% employed in the private sector. This distribution is unbalanced if one considers that the private sector accounts for only around 20% of the population. The balance of the population makes use of a publicly funded hospital and primary care clinic system funded out of general tax revenue (Roberts, 2000; Steinberg, Kinghorn, Söderlund, Schierhout & Conway, 2002). The distribution does however confirm that audiologists in South Africa need to be trained to be able to work in a variety of settings. The issue of human resources within the public sector has been identified as a priority by the Department of Health (Andrews & Pillay, 2005) and it seems from the above figures that there is a shortage of audiologists in the public sector to meet the needs of the South Africa population. The initiation of a year of community service has had the effect of creating new audiology posts in previously unserviced areas and will hopefully function to create a sustained increase in the number of permanent audiology posts in state hospitals and clinics.

The majority of respondents (37.77%) reported that they are employed in autonomous private practice, followed by 20.86% of graduates reporting employment in state hospitals. The figure of 20.86% presumably includes the 10 respondents that are community service officers. A study by Van Vliet, Berkey, Marion and Robinson (1992) showed a similar distribution with 36% of their sample working in private practice and 18% working in hospital settings. The primary workplaces that South African audiologists are employed in are thus similar to those of American

audiologists.

The sample consisted of respondents working in all nine provinces. The majority of respondents were employed in Gauteng and the minority of respondents was employed in the Free State (3.66%) and the Northern Cape (1.47%). This is ironic if one considers that the data collected in Census 2001 (Statistics South Africa, 2003) indicated that province most affected by disability was the Free State with a prevalence of 6.8% and the province least affected by disability was Gauteng (3.8%). There is thus a mismatch between the provincial employment of speech-language therapists and audiologists and the prevalence of persons requiring those services. The table below shows the number of speech-language therapists to people serviced per province. In the researcher's opinion, the ratio of audiologists to people per province is conceivably even higher given that fewer graduates are practicing as audiologists. The Department of Health aims to address this imbalance through the distribution of human resources within the structure of community service (Andrews & Pillay, 2005)

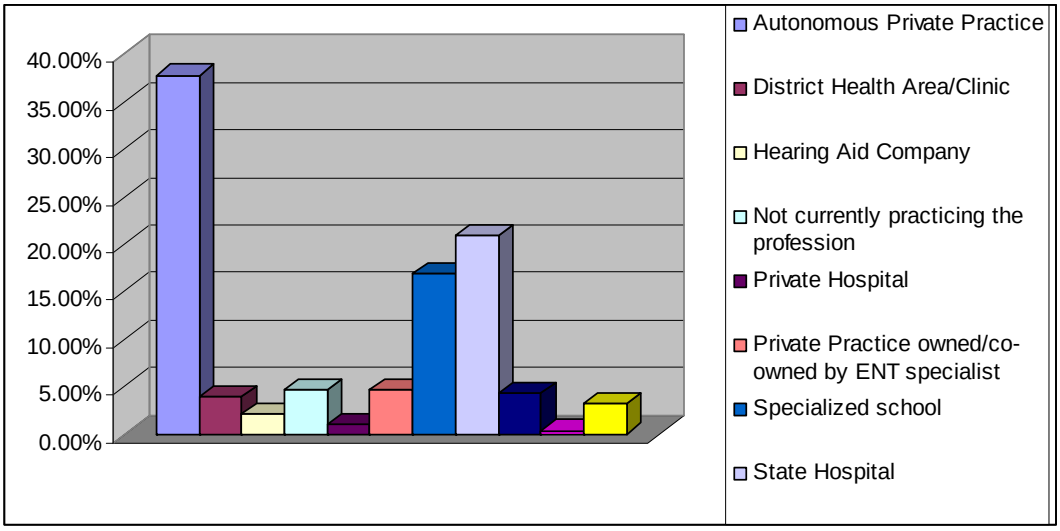

Figure 56. Distribution of respondents practicing as audiologist across primary workplace setting (n = 278).

Table 30. Number of person served by a speech therapist by as cited by Benatar (2004)

Province	Number served per Speech Therapist
Eastern Cape	950 583
Free State	157 279
Gauteng	79 714
KwaZulu-Natal	170 391
Limpopo	197 418
Mpumalanga	151 681
Northern Cape	244 986
North West	235 777
Western Cape	35 489
National Average	172 793

The fact that the ratio of speech-language therapists to clients in the Eastern Cape is 1:950 583 is testimony to the enormous need for services in that province and yet only 5.13% of the sample was employed in the Eastern Cape. It is the researcher's hope that the Department of Health uses figures such as these as a basis to place Community Service Officers.

All official languages were reportedly confronted in clinical practice. It is clear from figure that the majority of graduates are able to provide services independently in English and Afrikaans, but very few are able to provide services in any of the other official languages of the country. The results are not consistent with the distribution of home languages spoken in South Africa and the call by Prof. Singh to ensure that the demographics of student intake reflect the demographics of the country is thus justified (HPCSA, 2005).

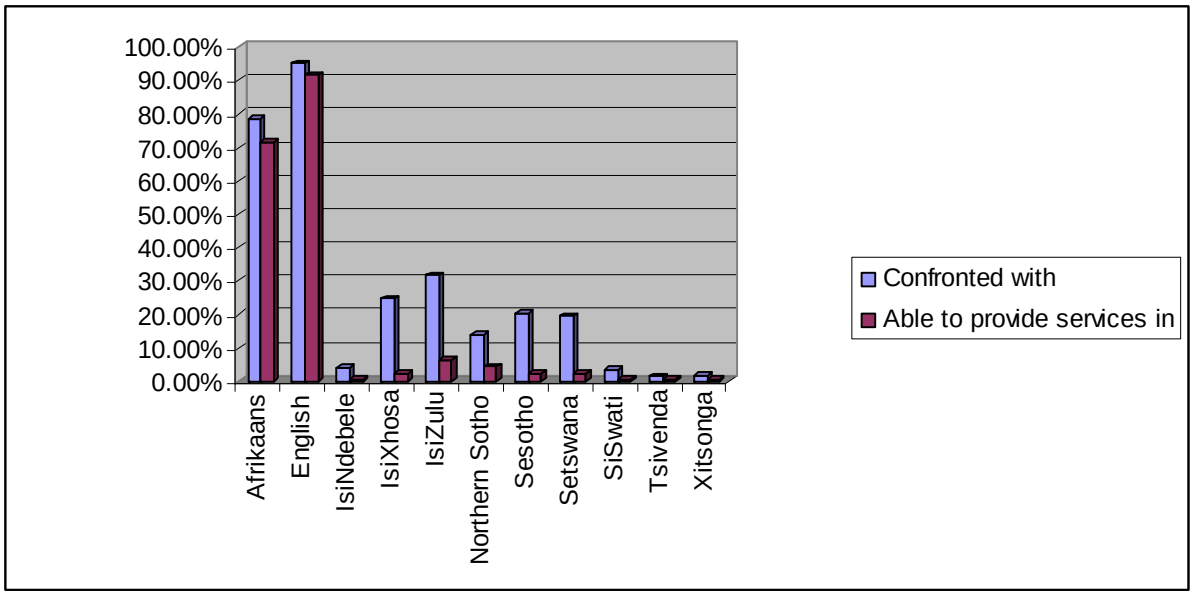

Figure 57. Languages confronted with in the workplace and languages in which independent services can be provided (n = 284).

Ramkissoon and Khan (2003) make the point that despite the possible "language mismatch" between client and audiologist, effective and appropriate communication is important. The most obvious solution to the communication breakdown is the use of an interpreter who is competent in the client's language and can facilitate communication. To ensure the optimum use of interpreters, adequate training should be provided so that responsibilities and boundaries are clearly defined (Ramkissoon & Khan, 2003). Only 8.49% of the respondents in this survey reported having access to trained interpreters, while 38.01% used untrained interpreters. A total

of 32.84% reported that they did not have access to interpreters, while 20.66% reported that they did not need the services of an interpreter.

It seems clear from the above results that much of the South African population that require audiological services are unable to access these services in their home language or via a trained interpreter. There are two possible solutions to this situation. The one involves the selection of students into undergraduate programmes based on language proficiency and the other involves the training of interpreters. The HPCSA has commissioned a Language Task Group to lead the process of the language issue facing the profession and is tasked with assessing training and education concerns (Shout, 2005).

More than a decade ago, Hugo and Uys (1990) called for consideration of curriculum reform and suggested that cultural and linguistic diversity be taken into account in curriculum design. Furthermore, they suggested the need for audiology assistants and the training of community rehabilitation workers. It may be prudent to consider introducing an audiologist assistant diploma that would also take linguistic competence into account so that assistants could also function as interpreters. The sample indicates that the current graduates in speech-language therapy and audiology are not evenly distributed in terms of linguistic competence and it may take time to change the demographics of students attracted to the course through marketing campaigns. The marketing campaign of a new diploma for audiology assistants could directly address the issues of linguistic competence and cultural diversity, providing a more immediate solution to the current situation.

Data from Census 2001 (Statistics South Africa, 2003) revealed that IsiZulu is the most common home language and it thus stands to reason that if a second language is included in an undergraduate degree programme, audiology students would do well to learn IsiZulu.

The Health Professions Council of South Africa (HPCSA) has instituted Continuing Professional Development (CPD) with effect from 01 January 2007. With the introduction of CPD, 45.19% of respondents indicated their intention to remain registered on both the Speech Language Therapy and Audiology registers, while 24.44% indicated that they would only maintain one registration. 21.11% were undecided and 9.26% reported that the question was not applicable – suggesting that they had completed a split curriculum and were thus only eligible for registration on one or the other register. This is unexpected since professionals who wish to maintain dual

registration are required to obtain twice the number of units (60 in total) as their single registered colleagues. Given the costs and time involved, the researcher had postulated that CPD would force respondents to choose between the professions of speech-language therapy and audiology, with only a few exceptions. Informal discussion with members of the South African Association of Audiologists (SAAA) revealed that most believe this to be a financial decision in that many are anxious to give up their speech-language therapy skills in case they are unable to find work as an audiologist. This suggests that respondents may perceive having a single qualification in audiology as risky in terms of the job market in South Africa. Furthermore, the initial financial layout for the equipment makes establishing a private practice daunting for many audiologists. Many audiologists thus initially supplement their income by practicing speech therapy until their audiology practice is established.

4.2 Audit of Audiological Service Delivery in South Africa

Of relevance to a discussion of the perceived adequacy of theoretical and clinical undergraduate training in audiology, is a notion of the services that are being provided by audiologists in South Africa. Tables 32 and 33 show the results of an audit of audiological service delivery in South Africa (Naidoo, 2006).

Table32. Clinical Services that were listed as "always" performed in an audit of clinical service delivery in South Africa (Naidoo, 2006)

Clinical Service	***n***	**% Always**
Pure Tone Audiometry (Air & Bone Conduction)	150	90.67
Speech Reception Testing	147	53.06
Speech Discrimination Testing	147	57.14
Tympanometry	148	67.57
Acoustic Reflexes	148	42.57
Play Audiometry	145	42.07
Hearing Aid Selection & Fitting (Adults)	146	65.75
Hearing Aid Selection & Fitting (Paediatrics)	146	43.84
Hearing Aid Verification & Validation (Adults)	145	46.90
Fine Tuning Using Manual Trimmers	144	44.44

Table 33. Clinical Services that were listed as "never" performed in an audit of clinical service delivery in South Africa (Naidoo, 2006)

Clinical Service	*n*	% Never	*Primary Reason for "Never"*
Cerumen Management	145	53.10	*Insufficient Training*
Behavioural Site of Lesion Tests	143	56.64	*Equipment*
Behavioural Auditory Processing Tests	141	65.96	*Equipment*
Otoacoustic Emissions (OAEs)	144	46.53	*Equipment*
Auditory Brainstem Response (ABR)	144	75.00	*Equipment*
Middle Latency Response (MLR)	140	95.71	*Equipment*
Late Latency Response (LLR)	140	98.57	*Equipment*
P300	140	97.86	*Equipment*
Mismatch Negativity (MMN)	139	98.56	*Equipment*
Auditory Steady State Response (ASSR)	142	92.25	*Equipment*
Electrocochleography (ECochG)	140	95.71	*Equipment*
Electronystagmography (ENG)	140	87.86	*Equipment*
Neurological Intraoperative Monitoring	140	95.71	*Equipment*
Visual Reinforcement Audiometry (VRA)	143	50.35	*Equipment*
Multifrequency Tympanometry	143	73.43	*Equipment*
Real Ear Measures and Insertion Gain	139	71.94	*Equipment*
Bond Anchored Devices	145	73.79	*Equipment*
Cochlear Implant Mapping	144	93.06	*Equipment*
Auditory Brainstem Implants	142	97.89	*Equipment*
Assistive Listening Devices (ALDs)	144	49.31	*Equipment*
Implementation of a Neonatal Screening Programme	140	53.47	*Insufficient Caseload*
Community Outreach Screening (Adults & Children)	143	40.56	*Time Constraints*
Ototoxicity Monitoring	144	56.94	*Insufficient Caseload*
Industrial Audiology	141	50.35	*Insufficient Caseload*
Manual Communication Skills (e.g. Sign Language)	146	69.18	*Insufficient Training*
Language Therapy with a Hearing Impaired Child	145	38.62	*Insufficient Caseload*
Cochlear Implant Habilitation	145	82.76	*Insufficient Caseload*
Cochlear Implant Rehabilitation	144	84.03	*Insufficient Caseload*
Vestibular Rehabilitation	143	84.62	*Insufficient Training*

The findings of Naidoo's study indicate that basic audiological tests and play audiometry are performed routinely and hearing aids are regularly dispensed and fine-tuned with manual trimmers. The most common primary reason cited for services not being provided was a lack of equipment. Most advanced behavioural and electrophysiological tests are reportedly not performed in South Africa due to a lack of availability of equipment due to financial constraints. Interestingly, Naidoo's (2006) results indicated that audiologists did not provide neonatal hearing screening, ototoxicity monitoring, industrial screening, cochlear implant (re)habilitation and language therapy due to a lack of caseload. Respondents also indicated that they did not provide community hearing screening programmes due to time constraints. This is concerning if one considers the Department of Health move towards a Primary Health Care (PHC) model that advocated prevention (WHO,1978) and the release of the HPCSA 2007 Position Statement of Early Hearing Detection and Intervention (EDHI).

There is a need for ototoxicity monitoring in the South African population, given the prevalence of HIV/AIDS, Tuberculosis and Malaria (Andrews & Pillay, 2005). The introduction of commercially available audiometers that are able to test the extended high frequencies and the availability of OAEs provide the technology to detect early changes in hearing status make it feasible to monitor the effects of ototoxic medication. It is concerning to the research that many South African audiologists indicate that they do not provide ototoxicity monitoring due to there being an insufficient case load in their practices (Naidoo, 2006). This perhaps reflects a lack of knowledge in the area of ototoxicity, which could be addressed through CPD courses.

The HPCSA has issued a year 2007 position statement for regarding Early Hearing Detection and Intervention (EDHI) programmes in South Africa. The professional board endorses the development of early hearing detection and intervention programmes stipulates that all infants should be afforded access to hearing screening. The fact that respondents cited “insufficient caseload” as the primary reason for not performing neonatal hearing screening thus seems contradictory to the notion of universal screening. It seems that the lack of engagement in neonatal hearing screenings may not be directly related to training, but to a lack of insight regarding the importance of early detection and intervention. This may be addressed through CPD as the research of Yashinago-Itano & Gravel (2001) clearly indicates that those infants with confirmed hearing loss that are identified early and receive intervention by 6 months of age develop language in a similar way to their hearing peers. Swanepoel (2005, 2006, 2007) has published widely regarding newborn hearing screening in the South African context so there is contextually relevant literature that audiologists can consult.

The only services not provided due to insufficient training were reported to be cerumen management, vestibular rehabilitation and manual communication skills (Naidoo, 2006). Vestibular rehabilitation is excluded from the current scope of practice, so this result is not unexpected. The area of cerumen management is not mentioned in the HPCSA scope of practice document (HPCSA, 2005) and is a topic that should be debated given the impact that cerumen has on the ability of an audiologist to effectively deliver most clinical services. The South African Association of Audiologists (SAAA) is currently discussing the need for a course in cerumen management to be offered by an Otolaryngologist as an additional licensing course (Hornby, 2007).

4.3. Perceptions Regarding the Adequacy of Undergraduate Training.

4.3.1 Basic Audiology

In terms of the services included in the "basic audiology" theme, the majority of respondents indicated that they regarded their undergraduate theoretical training as "completely preparing" them for the demands of their workplace. The only exception was "cerumen management" for which the respondents felt "somewhat prepared" by their undergraduate theoretical training. This is of interest since cerumen management is not included or even mentioned in the official scope of practice document issued by the HPCSA. However, the majority response of "somewhat prepared" suggests that participants are of the opinion that they do possess knowledge in this area from their undergraduate training. This response was unexpected since the results of Naidoo's study (2006) indicated that the primary reason listed for not providing cerumen management services was "insufficient training". Of concern in this regard is the fact that responses regarding the adequacy of clinical training in this area varied and 13.82% of respondents indicated that they felt "completely prepared" to perform cerumen management. This raises concerns that some audiologists may be performing cerumen management despite the fact that it is currently not within the scope of practice.

A study by Olusanya (2003) showed that children with impacted wax were more likely to have hearing loss, more likely to have hearing loss of a permanent nature and more likely to suffer from otitis media with effusion. Olusanya (2003) suggests that "the prevention of cerumen impaction should be of significant public health concern in the management of hearing impairment in children, especially where there is not routine and systematic screening for hearing disorders." (p121). Studies of the epidemiology of impacted wax indicate that the condition is common, with between 2% and 6% of the general population suffering from impacted wax (Guest, Greener, Robinson & Smith, 2004).

In South Africa, since audiologists are not permitted to provide cerumen management, patients are generally referred to medical practitioners, ENT specialists or nurses for this service. This results in delayed audiological services and many patients getting lost in the system or need to face long waiting lists. If the PHC model, advocated by the Department of Health, is to be followed efficiently, then audiologists need to be able to perform cerumen management.

4.3.2. Diagnostic and Electrophysiological Tests

The ASSR is an auditory evoked potential elicited with modulated tones. It can be used to predict the sensitivity of patients of all ages and is unaffected by patient state (Stach, 2002). The ASSR only became available commercially in the early 2000's and is thus a relatively recent addition to the evoked potential repertoire (Stach, 2002). The fact that many respondents did not cover ASSR in their undergraduate curricula and felt "completely unprepared" to perform an ASSR is a reflection of the fact that most graduated prior to 2000. South African researchers have conducted local research into the use of ASSR (Swanepoel, Schmulian & Hugo, 2004) and research by de Koker (2004) has investigated the application of ASSR to industrial contexts. The ASSR should thus be considered as a potential topic for CPD as research suggests that the ASSR has the potential to be a valuable procedure for the assessment of hearing loss and may have applications in the diagnosis of neural pathologies (Stach, 2002).

4.3.3. Paediatric Audiology

Participants generally felt prepared for paediatric audiology by their theoretical and clinical undergraduate courses, with the exception of multifrequency tympanometry. Research has indicated that the conventional 226 Hz probe tone used in tympanometry is invalid below 21 weeks and 1000 Hz is the probe tone of choice (Baldwin, 2006). This clearly has important implications for neonatal hearing screening. A majority of 27.45% of respondents reported that multifrequency tympanometry was not included in their undergraduate training and 24.77% felt "completely unprepared" regarding the use of multifrequency tympanometry, followed by 22.94% who felt "somewhat prepared". The fact that multifrequency tympanometry was not included in the undergraduate training of the majority of respondents is testimony to the increasing scope of practice of audiologists and improved technology.

Multifrequency tympanometry has an important role to play in paediatric audiology with the move towards universal newborn hearing screening. The use of multifrequency tympanometry (most notably the 1000 Hz is advocated to distinguish between cochlear hearing loss and middle ear pathology in the case of a baby not passing an OAE screening. The Year 2007 position statement on Early Hearing Detection and Intervention advocates the routine use of multifrequency tympanometry as part of the screening protocol (HPCSA, 2006). Improving the knowledge of audiologists regarding multifrequency tympanometry could be addressed via CPD courses.

4.3.4. Amplification

Overall, the academic and clinical training in amplification requires attention. Audiologists are regarded as the single most important resources for non-medical habilitation or rehabilitation of hearing loss (Roeser, Valente and Hosford-Dunn, 2000) and it is the sale and dispensing of hearing aids that makes private practice financially feasible in South Africa (du Plooy, 2007). These two factors highlight the importance of amplification in the undergraduate audiology curriculum. The majority of respondents felt that their academic education had only "somewhat prepared" them to use real ear measures and insertion gain, to select and fit hearing aids in adults and paediatrics and to verify and validate their fittings. They also only felt "somewhat prepared" regarding the use of assistive listening devices.

In terms of clinical preparation afforded for the theme of amplification, there was a great deal of variation in responses. The majority of respondents (23.48%) reported feeling "poorly prepared" to perform real ear and insertion gain measures. The majority of respondents were of the opinion that clinical undergraduate training only "somewhat prepared" them for hearing aid selection, fitting, verification and validation in adults and paediatrics. Of great concern is the fact that the majority of respondents felt completely unprepared regarding the use of NOAH via the Hi-Pro Box for fine tuning.

The majority of respondents indicated that the use of software to programme hearing aids through the NOAH system had not been included in their training. Of concern is that a majority of 28.57% of respondents for whom NOAH was included in the curriculum, expressed the opinion that the training had left them "completely unprepared" in this regard.

The majority of respondents indicated that their academic training had "completely unprepared" them for both cochlear implant mapping and the use of bone anchored devices. The fact that respondents felt inadequately trained for cochlear Implant mapping is appropriate since this is excluded from the current scope of practice (HPCSA, 2005) and requires additional licensing. That respondents felt inadequately educated regarding bone anchored devices is problematic in that implantable hearing aids are becoming more widely used and bone anchored devices are available on the state tender in government hospitals. The implementation of cochlear implant programmes in public service is currently in its pilot phase (Brough, 2006), suggesting that the current scope of practice may need to be reviewed in the future to include cochlear implant mapping.

4.3.5. Hearing Conservation and Prevention

In terms of the theme of hearing conservation and prevention, the majority of respondents indicated that they were “somewhat prepared” for the implementation of neonatal hearing screening programs (27.48%), ototoxicity monitoring (30.95%) and industrial audiology (30.56%) by their undergraduate academic curriculum. The majority of participants also indicated that they considered themselves to be “well prepared” for community outreach screening (27.82%) by the theoretical training. Overall, the academic training regarding hearing conservation and prevention seems to be adequate. This is important in that the Department of Health has embraced a Primary Health Care philosophy through the National Health Act of 2003, which emphasizes prevention at all levels (Hall, Ford-Ngomane & Baron, 2005; WHO, 1978).

4.3.6. Habilitation and Rehabilitation

The majority of respondents indicated that their academic training had “somewhat prepared” them for (re)habilitation services. This included instruction in auditory training (35.17%), speech reading (35.97%), manual communication skills (30.16%), tinnitus management (29.69%) and counselling (32.88%). Interestingly, a majority of 34.25% felt “well prepared” for language therapy with hearing impaired children, which is most likely a testimony to the current structure of training programmes in South Africa which provide a strong basis in speech pathology. Cochlear implant (re)habilitation was excluded from the curriculum of the majority of the participants, and those who did cover it in their academic training felt “completely unprepared”. This is of concern in that the audiologist responsible for mapping the cochlear implant (which requires additional licensing), does not have to be the same professional responsible for (re)habilitation.

Vestibular diagnosis and management is an area that must be addressed in future curriculum design. An epidemiological study from Germany (Neuhauser, 2007), indicated that 70% of all dizziness/vertigo suffers consult a physician and vestibular vertigo accounts for 29% of these cases. Furthermore, vertigo is recurrent in 88% of cases and causes severe impairment in 80% of cases.

The majority of respondents either indicated that their academic training left them “completely unprepared” for vestibular rehabilitation (28.18%) or indicated that it was not included in their curriculum (27.15%), which is appropriate since vestibular rehabilitation is excluded from the

current scope of practice (HPCSA, 2005). A total of 42% of respondents felt that their academic and clinical training left them “completely unprepared” to perform vestibular diagnostic services. It thus seems that graduates are inadequately prepared to perform diagnostic services, which is current within the audiology scope of practice. However, from an ethical perspective, the fact that vestibular management is currently excluded from the scope of practice is of concern. Vestibular diagnosis and management is an area that requires debate and review regarding its place in professional training and the scope of practice.

4.3.7. Miscellaneous Services

Of concern is the fact that the majority of respondents (39.99%) reported that the audiological management of HIV/AIDS patients had not been included in their academic curriculum. Of those who did have audiology included in the curriculum, the majority (25.27%) reported that the academic curriculum had “somewhat prepared” them to deal with HIV/AIDS and 24.18% felt “completely unprepared”. A survey of 40 speech language therapists and audiologists employed in South African provincial hospitals, (Druck & Ross, 2002), indicated that persons with HIV/AIDS were becoming an increasing part of the caseloads. Investigation of participants' training, knowledge, skills and confidence in the area of HIV/AIDS suggested that the group surveyed did not perceive themselves to be adequately equipped to manage persons with HIV/AIDS. The inclusion of HIV/AIDS and communication disorders in the undergraduate curriculum is essential and graduates should be educated in this regard through CPD programmes.

The majority of respondents felt “somewhat prepared” for community work (26.83%), working with interpreters (34.71%), dealing with Deaf culture issues (33.83%) and designing and conducting clinical research (30%) by the academic undergraduate curriculum.

The majority of participants were of the opinion that their undergraduate education left them “completely unprepared” for practice management, while 22% indicated that it had not been included in the undergraduate curriculum. This is of concern if one considers that more than half of the respondents practising as audiologists are employed in the private health sector. Hosford-Dunn, Roeser & Valente (2002) make the point that audiology practices must exist both as “profit-making businesses” and “community resources”. Business acumen and financial skills should be taught at an undergraduate level given that many audiologists are dependent on hearing aid dispensing to make their practices financially viable and cash flow is thus a concern.

Supervision of students and junior audiologists was not included in the curriculum for a majority of 31.54% of respondents which is concerning since supervision is now a minimum competency requirement for new graduates (HPCSA, 2005).

Graduates from MEDUNSA generally perceived their undergraduate theoretical and clinical training to be more adequate than graduates from other South African universities and this can be attributed to the fact that the programme at MEDUNSA was only established recently and thus only represents newly qualified graduates. There is thus a recency effect at work in the responses indicated by MEDUNSA graduates as opposed to graduates from other more established programmes. The small number of respondents from MEDUNSA compared to the number of respondents from other South African universities may also have had an impact on results. Another postulation is that MEDUNSA graduates may have exhibited a social desirability effect given that they are amongst the first graduates from a new programme.

Respondents who had graduate after 2001 generally perceived their undergraduate training to have prepared them more adequately than those who had graduated prior to 2001. This can be attributed to the recency effect as well as curriculum changes implemented based on the experience afforded by community service placements. This is confirmed by the fact that respondents registered with the HPCSA as community service officers reported their training in diagnostic and physiological tests, paediatric audiology, hearing conservation and prevention and services listed as miscellaneous to be superior to respondents registered as speech-language therapists, audiologists or speech-language therapists *and* audiologists. Of importance is the fact that community service officers did not perceive their training in amplification to be more adequate than those respondents registered in other categories of the HPCSA.

Participants employed in the private sector were less in favour of the inclusion of habilitation and rehabilitation services in an undergraduate curriculum than those working in the public sector. It is postulated that this is due to the fact that few private practitioners engage in rehabilitation services, while these services are common practice in the public sector.

4.4. Future Curriculum Design in terms of Content and Structure

Respondents seemed unable to distinguish between services that might reflect a core audiology

curriculum and those that may be appropriate to a postgraduate curriculum. This is consistent with the fact that the large majority of participants felt that an undergraduate curriculum structure was most appropriate as a minimum entry-level into the profession. The only services identified as appropriate for a postgraduate curriculum were P300, MMN, ECochG, ENG, Cochlear Implant Mapping and Auditory Brainstem Implants. The only service identified as requiring Additional Licensing was Neurological Intraoperative Monitoring. This is in contrast to the scope of practice stipulated by the HPCSA (2005) which excludes both Cochlear Implant Mapping and Vestibular Management.

Of concern is that the results of Naidoo's (2006) study indicated that the services that are "always" provided by audiologists in the South African context reflect a very limited repertoire of clinical services are generally those that fall under the scope of practice of a hearing aid acoustician. The full scope of audiology is currently not being practiced in the South African context mostly due to a reported lack of availability of equipment.

4.6. Future Training Programs

A majority of 91.58% of respondents were of the opinion that an undergraduate audiology programme should be situated within a Faculty of Health Sciences and be termed a Bachelor of Audiology. Respondents thus perceive that the profession should be situated in the same faculty as other allied health professionals and the degree should have a professional identity.

The majority of respondents (70.76%) indicated that a research component is essential at an undergraduate level. In terms of area of undergraduate research, 56.72% of participants indicated that they had completed their undergraduate research report in speech-language pathology, while 38.43% had completed the project in audiology. It appears that South African speech-language therapists and audiologists have insight into the importance of research for a profession. The majority of respondents (75.36%) indicated that the title of Doctor should be reserved for those who had completed a PhD in Audiology.

An overwhelming majority of 93.55% of responses indicated that the Au.D. is not appropriate for the South African context and 64.39% indicated that they were not in favour of a Masters degree as the minimum entry level into the profession of audiology either. There was agreement though that if a Masters degree were to be instituted as a minimum entry-level, a Clinical Masters degree would be more appropriate than a Masters by Dissertation or a Masters by Coursework

and Research. These results indicate that the profession in South Africa perceives an undergraduate degree as being sufficient as a minimum entry-level into the profession. This is problematic in that respondents indicated that the majority of clinical services included in the questionnaire should be included at an undergraduate level. Given the expanding scope of practise of audiology, this is not possible purely due to the amount of content that would need to be covered within a four-year degree structure. Of even bigger concern is the fact that the majority of respondents (64.87%) indicated that they would study a degree in speech and hearing therapy if they were to complete their undergraduate studies again. This is consistent with the report that a majority of 45.18% of respondents intend maintaining dual registration with the HPCSA in terms of CPD.

A majority of 70.04% of respondents indicated that they are in favour of the HPCSA instituting a national exam to ensure consistency of training programmes. This is positive in that it would provide internal consistency within the profession and lead to what Spankovich (2003) terms consensus. This would have the effect of streamlining training so that all professionals who call themselves “audiologists” have the same minimal competencies and the profession of audiology has a clear identity.

4.7. Conclusion

Despite the low return rate, the research sample was felt to be representative of the South African population of speech-language therapists and audiologists in terms of university where undergraduate degree was obtained, year of graduation, province of employment and workplace. Although the small sample size suggests that caution should be exercised in generalizing the findings, the researcher is of the opinion that as a pilot study, the research results depict a fairly accurate snapshot of the perceived adequacy of audiology training programmes in South Africa. It would be interesting to administer the same questionnaire in five years time to a larger sample to compare results.

In summary, the study showed that respondents generally felt completely prepared by both their theoretical course and clinical training for all aspects of basic audiology except for cerumen management. This is in keeping with the current legal scope of practice, which does not include cerumen management.

Respondents generally felt somewhat prepared for diagnostic and electrophysiological tests by their theoretical course, but the clinical training left them feeling completely unprepared for applications

such as the MLR, LLR and P300 as well as ECochG and ENG. These diagnostic tests are not used routinely and were identified as areas that should be included in a postgraduate course in audiology. Of concern is that respondents felt only " somewhat prepared" by their clinical training in terms of performing OAEs and ABRs, which are considered to be a standard part of an audiological test battery today. Clinical training in these areas should be addressed.

With the exception of multifrequency tympanometry, respondents generally felt that both theoretical courses and clinical training had completely prepared them for paediatric audiology.

Amplification is an area that raised concern from a training point of view. The majority of respondents felt only "somewhat prepared" by their theoretical training to select, fit, verify and validate a hearing aid fittings and to select assistive listening devices. The clinical training in this area was regarded as inadequate and generally left respondents feeling "poorly prepared" or only "somewhat prepared". This is of concern in that the non-medical management of hearing loss more often than not involves some form of amplification in the form of hearing instruments, assistive listening devices or a combination thereof. If audiologists are to defend their position as being the best qualified professionals to dispense hearing instruments, then the curriculum in terms of theoretical and practical training must be revised.

Respondents felt somewhat prepared to complete hearing conservation and prevention programs although the majority reported feeling "completely unprepared" or "poorly prepared" by their clinical training to initiate an ototoxicity monitoring programme.

Cochlear implant habilitation and rehabilitation were generally not included in the undergraduate training in the majority of respondents. This is perhaps an area that could be targeted for CPD. Vestibular rehabilitation was also reported as not having formed part of the undergraduate curriculum of the majority of repsondents, which is in keeping with the minimum competencies set out by the HPCSA which excluded management of vestibular disorders. Respondents generally regarded their clinical training as having completely unprepared them for tinnitus management.

It is concerning that the majority of graduates did not receive training in the audiological management of HIV/AIDS related hearing loss and this is possibly testimony to the growing pandemic. Once again, this is possibly a topic that should be addressed through CPD.

The majority of respondents indicated that they intended to maintain their dual register status with the HPCSA through CPD and reported that they would complete a degree in Speech-Language and Hearing therapy if they were to choose a degree structure again. This indicates that this sample of the profession in South Africa does not recognize the need to train the professions of speech-language therapy and audiology separately, despite the fact that the professions are recognized as independent and autonomous by the HPCSA. These findings are congruent with the parallel study conducted by Naidoo (2006), which indicated that the majority of audiologists are conducted basic testing and diagnostic audiology is still in its infancy in South Africa. This is perhaps testimony to the fact that audiology does not have a well-entrenched professional identity in South Africa and many seem to regard it as financially risky to only have a qualification in audiology. There is also a sense that many professionals believe that grounding in speech-language pathology is essential to an audiology curriculum.

Respondents were unable to discriminate between a core undergraduate curriculum and a postgraduate curriculum for future training programmes in audiology. These findings support the view that an integrated training programme of speech-language pathology and audiology (allowing dual registration) simply attempts to cover too much content over too short a period of time.

Despite its popularity with respondents, the current 4-year professional degree structure does not appear to adequately prepare graduates for in the areas of amplification, practice management and supervision, the diagnosis and management of vestibular disorders and the audiological management of persons with HIV/AIDs. There is thus a need for educational reform based on the adequacy of undergraduate training programmes.

There are a number of curriculum structures that could be explored for future training programmes. The structure currently in place at the Universities of Pretoria and KwaZulu-Natal is a 2+2 structure that requires students to make a decision to follow a career in speech-language pathology ***or*** audiology after their second year of study. An alternative curriculum would be a 3+2 structure which would entail a 3-year undergraduate degree followed by a 2-year clinical Masters degree as the minimum entry level in the profession of audiology. The 3+2 structure would allow a solid 3-year undergraduate degree (which would not permit professional registration) in speech-language and hearing therapy, followed by an intense 2-year clinical Masters Degree.

The study has highlighted areas that could be target for CPD and it is useful to view CPD as an opportunity to provide knowledge and skills in areas where graduates perceived their undergraduate training to be inadequate. These areas include: amplification, vestibular testing, practice management and supervision, the audiological management of hearing loss related to HIV/AID, multifrequency tympanometry and ASSR.

The results of the study can be viewed as an accurate picture of the profession of audiology in South Africa today. Audiologists are generally performing very basic testing and feel competent doing so, but are not routinely engaging in more advanced diagnostic tests. This limits the profession of audiology in South Africa and contributes to the theory that South Africa needs "generalists" who can serve as both speech-language therapists and cursory audiologists. Furthermore, the majority of audiologists who have dual registration are reluctant to relinquish their dual registration, despite the fact that they may not intend to practice as speech-language therapists at some point. It seems that CPD is inherently flawed in this regard, as maintaining registration as a speech-language therapist by accumulating 30 points per year is not adequate professional development for a graduate not practising the profession.

Although the study suggests that audiologists are content with the status quo, the current situation does not hold the promise of growth of the profession. It is the responsibility of today's audiologists to "chart the course that defines our future" (Jacobson, 2002:54) and educational reform is central to doing so.

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APPENDICES

Appendix A: Cover Letter

Appendix B: Self-Administered Questionnaire

Appendix C: Ethical Clearance

Appendix D: Chi-Squared Analyses

Table A: Effect of University on Preparedness

	Theory		Clinical	
	Chi-Square	**Pr > Chi-Square**	**Chi-Square**	**Pr > Chi-Square**
Amplification				
Assistive Listening Devices (ALDs)	9.7327	0.0832	20.482	0.001**
Auditory Brainstem Implants	5.3427	0.3755	17.4051	0.0038**
Bone Anchored Devices	5.026	0.4127	8.886	0.1137
Cochlear Implant Mapping	11.9211	0.0359**	16.2303	0.0062**
Earmould Modifications	20.059	0.0012**	14.6772	0.0118**
Fine Tuning Using HI-PRO & NOAH	17.0067	0.0045**	17.9761	0.003**
Fine Tuning Using Manual Trimmers	32.4133	<0.0001**	25.9905	<0.0001**
Hearing Aid Selection & Fitting (Adults)	24.6646	0.0002**	30.1526	<0.0001**
Hearing Aid Selection & Fitting (Paediatric)	12.8406	0.0249**	20.6438	0.0009**
Hearing Aid Verification & Validation (Adults)	20.3072	0.0011**	25.9137	<0.0001**
Hearing Aid Verification & Validation (Paediatric	9.9185	0.0776	17.6432	0.0034**
Real Ear Measures & Insertion Gain Measures	17.1279	0.0043**	26.3138	<0.0001**
Diagnostic and Electrophysiology Tests				
Auditory Brainstem Response (ABR)	6.9369	0.2254	10.3068	0.067
Auditory Steady State Response (ASSR)	6.6504	0.248	9.8484	0.0796
Behavioural Auditory Processing Test	9.8591	0.0793	17.878	0.0031**
Behavioural Site of Lesion Tests	3.9352	0.5588	12.3648	0.0301**
Electrocochleography (ECochG)	15.9935	0.0069**	12.5068	0.0285**
Electronystagmography ENG)	20.44	0.001**	23.1529	0.0003**
Late Latency Response (LLR)	5.9808	0.3081	16.3795	0.0058**
Middle Latency Response (MLR)	9.097	0.1053	16.8877	0.0047**
Mismatch Negativity (MMN)	8.6331	0.1246	17.0535	0.0044**
Neurological Intra-Operative Monitoring	7.2152	0.2051	16.2181	0.0062**
Otoacoustic Emissions (OAEs)	8.2776	0.1416	20.0406	0.0012**
P300	8.3659	0.1372	15.7265	0.0077**
Habilitation and Rehabilitation				
Auditory Training	16.9488	0.0046**	19.9052	0.0013**
Cochlear Implant Habilitation	7.8282	0.166	19.5499	0.0015**
Cochlear Implant Rehabilitation	10.0101	0.075	20.9932	0.0008**
Counseling Related to Psychology impact of Hearing	4.0944	0.5359	4.4483	0.4868
Language Therapy with a Hearing Impaired Child	28.5535	<0.0001**	28.5289	<0.0001**
Manual Communication Skills	6.6082	0.2514	10.7594	0.0564
Speech Reading	5.1077	0.4029	9.4973	0.0908
Tinnitus Management	9.9215	0.0775	7.4986	0.1861
Vestibular Rehabilitation	12.2351	0.0317**	17.9341	0.003**

Table B: Effect of Year of Graduation on Preparedness	Theory		Clinical	
	Chi-Squ	Pr > Chi-Squ	Chi-Squ	Pr > Chi-Sq
Amplification				
Assistive Listening Devices (ALDs)	25.6353	<0.0001**	8.4519	0.0375**
Auditory Brainstem Implants	23.4678	<0.0001**	3.7756	0.2867
Bone Anchored Devices	19.8074	0.0002**	5.4175	0.1437
Cochlear Implant Mapping	24.3113	<0.0001**	6.2704	0.0992
Earmould Modifications	14.4753	0.0023**	11.0476	0.0115**
Fine Tuning Using HI-PRO & NOAH	39.1529	<0.0001**	4.0164	0.2597
Fine Tuning Using Manual Trimmers	18.7455	0.0003**	6.9734	0.0727
Hearing Aid Selection & Fitting (Adults)	11.9769	0.0075**	9.8661	0.0197**
Hearing Aid Selection & Fitting (Paediatric)	14.8566	0.0019**	16.0916	0.0011**
Hearing Aid Verification & Validation (Adults)	9.6649	0.0216**	5.604	0.1326
Hearing Aid Verification & Validation (Paediatric	14.9466	0.0019**	11.5621	0.009**
Real Ear Measures & Insertion Gain Measures	20.2302	0.0002**	1.6433	0.6496
Diagnostic and Electrophysiology Tests				
Auditory Brainstem Response (ABR)	15.7211	0.0013**	8.1137	0.0437**
Auditory Steady State Response (ASSR)	40.5867	<0.0001**	4.969	0.1741
Behavioural Auditory Processing Test	10.4869	0.0148**	1.3319	0.7216
Behavioural Site of Lesion Tests	3.0038	0.391	2.3816	0.4971
Electrocochleography (ECochG)	20.7203	<0.0001**	3.6941	0.2964
Electronystagmography ENG)	18.0278	0.0004**	3.1949	0.3625
Late Latency Response (LLR)	18.4826	0.0003**	4.8744	0.1812
Middle Latency Response (MLR)	18.4575	0.0004**	4.5235	0.2102
Mismatch Negativity (MMN)	31.4963	<0.0001**	3.8596	0.277
Neurological Intra-Operative Monitoring	29.2461	<0.0001**	10.6393	0.0138**
Otoacoustic Emissions (OAEs)	44.1609	<0.0001**	21.6592	<0.0001**
P300	31.3321	<0.0001**	3.2939	0.3485
Habilitation and Rehabilitation				
Auditory Training	8.4126	0.0382**	4.3134	0.2296
Cochlear Implant Habilitation	42.5847	<0.0001**	10.6353	0.0139**
Cochlear Implant Rehabilitation	40.9761	<0.0001**		
Counseling Related to Psychology impact of Hearing	16.4223	0.0009**	24.7557	<0.0001**
Language Therapy with a Hearing Impaired Child	4.7419	0.1917	10.3089	0.0161**
Manual Communication Skills	16.463	0.0009**	11.5523	0.0091**
Speech Reading	6.8455	0.077	7.2815	0.0634
Tinnitus Management	23.4923	<0.0001**	24.679	<0.0001**
Vestibular Rehabilitation	14.8893	0.0019**	5.4776	0.14
Hearing Conservation and Prevention				
Community Outreach Screening	19.9218	0.0002**	12.592	0.0056**
Implementation of a Neonatal Screening Programme	31.8474	<0.0001**	17.281	0.0006**
Industrial Audiology	28.279	<0.0001**	20.6126	<0.0001**
Ototoxicity Monitoring	19.9978	0.0002**	11.3064	0.0102**
Miscellaneous				
Audiological Management of HIV-Infected/Aids Patients	55.0424	<0.0001**	21.8165	<0.0001**
Community Work	27.2095	<0.0001**	8.45	0.0376**
Dealing with Deaf Culture Issues	38.5975	<0.0001**	9.0278	0.0289**
Designing & Conducting Clinical Research	23.4523	<0.0001**	11.599	0.0089**
Practice Management	40.731	<0.0001**	18.681	0.0003**
Report Writing & Administration	8.2625	0.0409**	13.9833	0.0029**
Supervision	3.5821	0.3103	6.1709	0.1036
Working with Interpreters	36.9559	<0.0001**	9.1673	0.0271**

Table C: Effect of Qualification on Preparedness

	Theory		Clinical	
	Chi-Square	Pr > Chi-Square	Chi-Square	Pr > Chi-Square
Hearing Conservation and Prevention				
Community Outreach Screening			8.1499	0.0043**
Implementation of a Neonatal Screening Programme			4.3874	0.0362**
Industrial Audiology			1.4288	0.232
Ototoxicity Monitoring			0.2617	0.609
Community Outreach Screening			8.1499	0.0043**
Implementation of a Neonatal Screening Programme			4.3874	0.0362**
Industrial Audiology			1.4288	0.232
Ototoxicity Monitoring			0.2617	0.609

Table D: Effect of Registration with HPCSA on Preparedness

	Theory		Clinical	
	Chi-Square	Pr > Chi-Square	Chi-Square	Pr > Chi-Square
Diagnostic and Electrophysiology Tests				
Auditory Brainstem Response (ABR)	1.5362	0.2152		
Auditory Steady State Response (ASSR)	11.9076	0.0006**		
Behavioural Auditory Processing Test	0.0589	0.8082		
Behavioural Site of Lesion Tests	0.3312	0.565		
Electrocochleography (ECochG)	2.1285	0.1446		
Electronystagmography ENG)	0.4177	0.5181		
Late Latency Response (LLR)	1.4973	0.2211		
Middle Latency Response (MLR)	1.6525	0.1986		
Mismatch Negativity (MMN)	4.3849	0.0363**		
Neurological Intra-Operative Monitoring	6.3502	0.0117**		
Otoacoustic Emissions (OAEs)	5.4598	0.0195**		
P300	3.5743	0.0587		
Hearing Conservation and Prevention				
Community Outreach Screening	11.1365	0.0008**	10.3442	0.0013**
Implementation of a Neonatal Screening Programme	7.0749	0.0078**	3.0644	0.08
Industrial Audiology	4.3834	0.0363**	4.8435	0.0278**
Ototoxicity Monitoring	5.0467	0.0247**	1.8333	0.1757
Miscellaneous				
Audiological Management of HIV-Infected/Aids Patients	7.8216	0.0052**		
Community Work	7.5494	0.006**		
Dealing with Deaf Culture Issues	4.2525	0.0392**		
Designing & Conducting Clinical Research	7.8242	0.0052**		
Practice Management	5.2843	0.0215**		
Report Writing & Administration	1.4402	0.2301		
Supervision	0.1868	0.6656		
Working with Interpreters	7.399	0.0065**		

Paediatric Audiology		
Behavioural Observation Audiometry (BOA)	0.2639	0.6074
Multifrequency Tympanometry	1.9219	0.1656
Play Audiometry	2.0231	0.1549
Visual Reinforcement Audiometry (VRA)	1.4511	0.2284

Table E: Test of Association between Future Audiology Curriculum and Workplace (Sector)

Habilitation and Rehabilitation	**Table Probability (P)**	**Pr <= P**
Auditory Training	0.0378	0.304
Cochlear Implant Habilitation	1.38E-04	0.0059**
Cochlear Implant Rehabilitation	2.94E-04	0.0123**
Counseling Related to Psychology impact of Hearing loss	0.0764	0.7978
Language Therapy with a Hearing Impaired Child	0.0027	0.0223**
Manual Communication Skills	8.30E-04	0.0258))
Speech Reading	0.0038	0.0564
Tinnitus Management	0.0295	0.7735
Vestibular Rehabilitation	0.0172	0.7798