NATIONAL UNIVERSITY OF LESOTHO

DEPARTMENT OF ENGLISH

THE IMPACT OF ALZHEIMER'S DISEASE ON SPEECH PRODUCTION AND COMPREHENSION

A Dissertation Submitted to the Department of English at the National University of Lesotho in Partial Fulfilment of the Requirements of Master's Degree in English Language and Linguistics.

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SPEECH PRODUCTION AND COMPREHENSION: THE CASE OF PEOPLE WITH ALZHEIMER'S DISEASE

National University of Lesotho

Certificate of Approval

MA Dissertation

This is to certify that this dissertation has been read and approved as having met the requirements of the department of English Language and linguistics, in the Faculty of Humanities, at the National University of Lesotho, for the Degree of Master of Arts in English Language and Linguistics.

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Declaration

I, the undersigned, declare that all the information contained in this dissertation entitled: **Speech Production and Comprehension: The Case of People with Alzheimer's Disease** is original and has not been submitted in its entity or part, to any institution for any qualification before. The references used in this work have been shown and acknowledged fully.

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Bolofo Naledi

Dedication

Dedicated to Mr. Avie Sebatana, whom taking care of is not a joyride due to his speech impairment.

ACKNOWLEDGEMENTS

ABSTRACT

Alzheimer's disease is a progressive disease beginning with mild memory loss and possibly leading to loss to carry on a conversation and respond to the environment. In a study by Corkin (1982), Alzheimer's disease patients had a naming deficit caused by failure to identify the objects. The study prompted this current research through an identification of a niche.

While the proof of concept (Exemplar Theory of Phonetics) has been promising, this study had a wide gap to address. In response to the gap in this field of study, the primary aim of this project was to add on to the knowledge in the area and devise a non-medical way to preserve speech production and comprehension in Alzheimer's disease. There were three research objectives in this study: (1) To identify phonetic dimensions affected in the production of speech through the identification of distinctive features, (2) To explore whether Basotho in Age Care Facilities have any interventions as explanatory treatment for poor speech production and comprehension in Alzheimer's disease, for the betterment of patient-carer relationship, and (3) To identify the role of exemplars in speech production. For these objectives to be met, a particular methodology had to be deployed. Through purposive sampling, the researcher chose the two Old Age Homes from which data was drawn. Nine Alzheimer's disease patients were used as participants in this mixed methods study through participation in the focus group. the data was in a form of recorded conversations, which was later transcribed verbatim and analysed through content analysis. This project was the first to investigate the linguistic communication aspects on Alzheimer's disease in Lesotho, and the key finding was that Alzheimer's disease has a negative impact on the communication of the carers and patients as the patients do not fully comprehend what is being said to them and they are unable to produce some speech sounds.

Keywords: Speech Production, Broca's area, Wernicke's area, Speech Comprehension, Alzheimer's disease.

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CHAPTER 1: GENERAL INTRODUCTION

1.1 Background to the Study

With help from the transcribed verbatim analysed trough content analysis, this research investigated the impact of Alzheimer's disease on the ability to comprehend and produce speech in older persons. The focus was on both theoretical linguistics and clinical implications for change in language function of this disease. By nature, this study is pure research. Bailey (1987) defines pure research as basic research. It involves developing and testing theories and hypotheses that are intellectually challenging and interesting to the investigator and might thus have some social application in the future. Pure research often involves testing hypotheses containing very abstract and specialised concepts.

1.1.1   Clinical Implications of Alzheimer's Disease (Cognitive Distortions)

This study investigated speech production and comprehension of people with Alzheimer's disease, who in some stages of the disease are no longer able to communicate meaningfully.

Alzheimer's disease is a chronic neurodegenerative disorder, characterised by three primary groups of symptoms. Burns et al., (1990) states that the first group is that of cognitive dysfunction; it includes memory loss, language difficulties, and executive dysfunction (loss of higher-level planning and intellectual coordination skills). Burns et al., (ibid.) further stipulate that the second group comprises psychiatric symptoms and behavioural disturbances, which include depression, hallucinations, delusions; and these are collectively termed non-cognitive symptoms. The third group comprises difficulties with performing daily activities such as dressing and eating unaided.

 The symptoms for this disease progress from mild symptoms of memory loss to severe dementia.

Alzheimer's disease is a progressive disease beginning with mild memory loss and possibly leading to loss of the ability to carry on a conversation and respond to the environment. Alzheimer's disease involves parts of the brain that control thought, memory and language. For an Alzheimer's disease patient, the brain cells do not function properly. According to Braak et al. (2011; 171) and Braak et al. (2011; 589), recent evidence indicates that

Alzheimer's disease process begins in the nuclei of the lower brain stem and send diffuse projections to a variety of sites and, particularly the cerebral cortex.

Predominantly involved is the longest accumulation of noradrenergic neurons in the human brain, the locus coeruleus. Without light microscopically detectable precursors, non fibrillar abnormal tau (a tau is a protein that helps stabilise the neurons in the brain) can be seen in the proximal axon (an axon is a thin fibre that connects nerve cells so that they can communicate) of a few coeruleus neurons (neurons are nerve cells) on both sides of the brain stem in brains of remarkably young individuals (Braak et al., ibid.). The intra-axonal pathological material is strongly immunoreactive for hyperphosphorylated tau protein (AT8 antibody).

Tau molecules only become part of this pathological material when they have successfully cleared all of the cellular checkpoints for quality control and have arrived in the compartment of the axonal cytoskeleton (a cytoskeleton is a structure that helps cells maintain their shape and internal organisation) in a fully functional state. There, the soluble and natively unfolded tau molecules bind to microtubules and stabilise them, (Chin et al. 2000). Yu et al. (2009) further go on to state that, when directed by the local kinases and phosphatases, an equilibrium between tau microtubules binding and disengagement emerges, which indicates that a continuous alternation between a less highly phosphorylated state (bound to microtubules) and a hyper phosphorylated state (soluble in axoplasm) exist.

The periodically unbound hyper phosphorylated tau molecules are not immunoreactive-possibly, because these monomers are highly soluble and, as such, Yu et al (2009) continues to shed light by stipulating that, such monomers are only partially or not at all precipitated by the fixation fluid. In this context, however, it should be remarked that the initially formed nonfibrillar abnormal tau material is not rapidly distributed throughout all portions of the long axon of coeru-leus neurons, as might be expected were the hyper phosphorylated tau to consist of molecules circulating freely in the axoplasm.

Instead, the abnormal material resembles a viscous mass and moves slowly into more distal portions of the axon. Expressed in a different way, the formerly soluble hyper phosphorylated tau protein is subjected to radical changes: it persists in a hyper phosphorylated state, it is no longer subject to regulation within the axonal metabolism, it becomes completely resistant to autophagy and other endogenous cellular removal mechanisms, and it is precipitated by the fixation fluid, (Koyacech et al. 2010).

The neuron is abruptly confronted with material that is abnormal and that, assuming the formation of additional of hyper phosphorylated tau molecules is possible, gradually accumulates. For unknown reasons, the pretangle material in the somatodendritic compartment as well as the nonfibrillar abnormal tau in axons remains untagged by ubiquitin (Bancher et al. 1989; Uchihaya et al. 2001, Uchihaya et al. 2001, Kopke et al. 1993).

Presently, it is unclear at what point the axonal material converts into a b-pleated sheet conformation (Weaver et al. 2000; Ballatore et al. 2007; Maeda et al. 2007). According to tau-microtubule hypothesis, the abrupt appearance of pathologically modified forms of hyper phosphorylated tau initiates secondary changes within the microtubili of the axonal cytoskeleton, supposedly to the point of disintegration. The consensus is that anterograde or retrograde axonal transport can no longer occur effectively along such badly damaged axons.

From a morphological point of view, however, it cannot be observed which larger amounts of microtubule remnants are removed or that, lost components of axonal cytoskeleton are repaired or replaced (Baas, 2002). Instead, the abnormal material in axons slowly changes from its originally viscous condition into a hardened mass and forms AT8-immoreactive inclusions of more or less similar length interspersed by immune negative axonal segments, a condition that persists into the final states of the disease process (neurofibrillary stages V-VI). The inclusions appear to be inert, that is, they do not change in size and not shift in either direction, nor are they reabsorbed or degraded.

1.1.2   Liaison of Alzheimer's Disease, Language and the Elderly

The outcome of the Alzheimer's disease-related pathological process in general is not primarily determined by massive neuronal loss; rather it is the result of enormous numbers of surviving nerve cells with limited functionality. Alzheimer's disease is associated with initial memory loss, followed by impairments in cognitive function, language, visuospatial skills and executive function, and coupled with behavioural changes, (Cummings, 2002). Terminally, patients may become bedridden, incontinent and unable to communicate (Lopez et al. 2011).

Alzheimer's disease is the most common form of dementia, accounting to 60-80% of cases (Alzheimer's, 2014). In the United States, one in nine people aged above or 65 years has Alzheimer's disease (two thirds of whom are women), and one person develops Alzheimer's disease every 67 seconds (Alzheimer's; ibid.). Alzheimer's disease International estimates

that the prevalence of Alzheimer's disease will increase by 225% by 2050, affecting more than 115 million people globally. (Wimo, 2010), and more than 13.8 million people in the United States (Alzheimer's, 2014).

This disease imposes an intolerable burden on healthcare systems, society, patients, and their families, and is one of the leading contributors to disability among elderly people. As Keufer et al. (1998) puts it, caring for a patient with Alzheimer's disease can be stressful, especially if the patient displays neuropsychiatric symptoms, such as irritability, dysphoria and delusions. To ease the burden on carers of patients, this study sought to explore interventions as explanatory treatment for poor speech production and comprehension in Alzheimer's disease, which may result in good patient-carer relationship.

In most African countries, the population is aging, albeit at slower rates than the rest of the world. This aging population is expected to increase as the years go by. This population is ageing simultaneously with the unprecedented growth of its youth and its related challenges. Thus, the ageing population in Africa faces a different set of challenges. One major challenge the elderly face is the inability to comprehend and produce speech sounds effectively and in a meaningful manner due to Alzheimer's disease, thus, this paper focused on this small facet of Alzheimer's disease, which is its hinderess in speech sounds production and comprehension of language.

Language impairments are usually one of the first cognitive signs of the onset of Alzheimer's disease. Specifically, they are caused by a decrease of sociolinguistic aspects due to isolation as people tend to segregate the patients when they cannot understand what they are saying, this results to patients sinking into depression (Ferris, 2013). Language impairments in people with Alzheimer's disease include the distorted meaning of words, difficulties with finding a relevant word, naming, as well as speech or language comprehension (Ferris, ibid).

However, researchers in the field of gerontology assume that these sociolinguistic aspects considerably contribute to difficulties in the conversation flow, and thus lower cognitive abilities of the affected people. From a study conducted by Klimova et al (2015), it is evident that language comprehension of Alzheimer's disease patients particularly worsens during the moderate and severe phases of the disease.

In addition, Klimova et al. (ibid) further goes on to state that the affected people are not able to express themselves. Hence, they cannot communicate with their family members, relatives, or friends. They find themselves in total exclusion. Moreover, the loss of communication also

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has an enormous impact on their quality of life and considerably burdens their caregivers. Arrighi et al (2010), purport that in 80 percent cases, caregivers are family members (as is the case of the current researcher) whose life then undergo significant changes as well.

As Maserova et al (2015) pointed out, these caregivers are mostly middle-aged people with many responsibilities. Sometimes they even give up their jobs in order to help their loved ones. Besides losing their regular income, they often lose their relationship(s), free time, and eventually they end up in social isolation. This consequently affects their health as well. Further, these informal caregivers report communication breakdown with their loved ones, which often leads to worsening their mutual relations and contacts (Ferris, 2013).

This has prompted this current research to explore ways of helping these affected people through different communicative strategies.

1.2 Statement of the Problem

Kush (2005) defines a problem statement as a concise description of what is to be addressed in a proposed research. He states that it identifies a niche between the current state and the desired goal, and it shall be dependent on facts. A problem statement is an explanation in research describing issues that need to be studied. Its purpose is to identify the gap or a problem at hand, which shall be studied in a systematic way.

From a study conducted by Klimova et al. (2015), Alzheimer's disease patients are unable to express themselves and communicate with their family members, relatives or friends. They find themselves in total exclusion since there is a communication barrier and nobody understands them. In alignment with the definition that is used across the African continent, population that is 60 years and above is considered as older persons in Lesotho.

The newly developed Lesotho policy for Older Persons affirms the government's commitment to protect the righst and welfare of the ageing population. According to the Ministry of Social Development, about 8 percent of the population in Lesotho is 60 years and above. This makes roughly 174,589 old people in the country who are possibly not fluent in speech. The policy, however, does not address the issue of communication of the patients, as it is not mentioned at all. It could be that the government of Lesotho is not aware of the communication barriers that Alzheimer's disease causes.

At present Old Age pension is M800.00 (about $46.83) per month. Although the Old Age Pension has had positive impacts, evidence shows that the pension on its own may not be able to cover the needs of the older people, especially as older persons in Lesotho care for the orphaned grandchildren (Bello et al. 2007; Nyaguru, 2007; Tanga, 2008). According to Hogan (2004), the rising population of the elderly and their needs influenced the need for Old Age Homes.

Old Age is associated with chronic health problems. These are attributable to various physical and mental challenges due to age. According to Manenti et al. (2004) older people with Alzheimer's disease have a malfunction in non-linguistic areas, such as paying less attention and lack of self-control. In the moderate to severe phases of the disease, there is rapid increase in lack of verbal fluency, which results in breakdown of comprehension.

Most care of these victims of Alzheimer's disease is provided in the household in which they live. However, these households are likely to be poor. This is because the elderly are physically and economically challenged hence have few opportunities of earning income through work. Consequently, the elderly tend to be perceived as a liability. These people are unable to comprehend and produce speech thoroughly, therefore creating a communication breakdown between themselves and the carers.

In the first phase of Alzheimer's disease, patients usually have relatively small language problems, which are predominantly connected with lexical-semantic language difficulties such as naming things or being vague in what they intend to say. Thus one can speak empty speech or garden path sentences (I convinced her children are noisy), although the speech is phonologically, morphologically, and syntactically perfectly structured.

Communication is what differentiates human being from animals and it builds better relationships. In this regard, communication breakdown destroys relationships, this study therefore ventures into a journey to begin to maintain health for the elders with Alzheimer's disease who are in age care facilities in Lesotho, so they may be able to produce and comprehend speech efficiently in order to make communication easy for both themselves and their carers.

1.3 Aim of the Study

A research aim describes the main goal of the overarching purpose of a research project. It acts as a focal point for a research. According to Business Research Methodology (n.d),

formulating a research aim is one of the most important aspects of a dissertation. A research aim emphasises what needs to be achieved within the scope of the research process. Achievement of research aim provides answers to research questions.

The purpose of the aim of the study could be add to the knowledge in the area, to address and existing gap in the knowledge or to devise and test a solution to an existing problem. There already is an existing problem with people with Alzheimer's disease not being able to communicate effectively, the aim of this study was to explore production and comprehension of speech in people with Alzheimer's disease.

1.4 Research Objectives

Determining the research's aim leads naturally to determining its objectives. Research objectives are more specific than the aim, and relate directly to the research question(s) (Grove et al, 2014; Parahoo, 2014). The objectives may be divided into 'primary' (bound to be achieved) and 'secondary' (incidental) objectives (Newell and Burnard, 2011). Research objectives must be closely related to the research questions, cover all aspects of the problem, be specific, be ordered in a logical sequence, achievable, take into consideration the available resources; including time, and be mutually exclusive of each other.

The objectives of this study are as follows:

1. To identify phonetic dimensions affected in the production of speech through the identification of distinctive features.

2. To explore whether Basotho in Age Care Facilities have any interventions as explanatory treatment for poor speech production and comprehension in Alzheimer's disease, for the betterment of patient-carer relationship.

3. To identify the role of exemplars in speech comprehension.

1.5 Research Questions

Interest in a particular topic usually begins the research process, but it is the familiarity with the subject that helps define an appropriate research question for a study (Haynes, 2006). Questions arise out of a perceived knowledge deficit within a subject area or field of study.

The challenge in developing an appropriate research question is in determining which uncertainties could or should be studied and rationalising the need for their investigation.

As stated earlier in the Statement of the Problem, the elders suffer from quite a number of chronic health problems. However, the researcher shall look at Alzheimer's disease in particular because it hits closer to home as the researcher is a carer of an elder with Alzheimer's. Nonetheless, the carers play a role in this study because if the hypothesis is supported, it is both for their betterment (carers) and that of the patients.

In the USA, according to Klimova et al (2015), there is medication licenced for the treatment of the elderly, although the current possibilities of treatment just solve the symptoms. These drugs (shall be discussed in chapter 2) do not prolong patients' survival, but they are able to delay the most serious phases of Alzheimer's disease, increase memory, quality of life and self-sufficiency of Alzheimer's disease patients, and lower caregivers' burden.

Based on these facts, the current study is guided by the following questions:

1. Which phonetic dimensions are affected by Alzheimer's disease?

2. Do Basotho in Age Care Facilities have access to medication or any other intervention for Alzheimer's disease that may help improve their speech production and comprehension?

3. Can speech comprehension be enhanced through exemplars?

1.7 Purpose of the Study

According to Obasi et al. (n.d) The purpose of the study statement helps the subject assess the importance of the study relative to individual values. The statement should include not only the immediate purpose of the study, but also any larger, eventual purpose. The research purpose answers 'why' the study is being conducted.

Bringing it closer to home, this study has been triggered by the burden that carers endure while taking care of patients with Alzheimer's disease who at some stages of the disease are unable to fully comprehend and produce speech. Traditionally, in Lesotho, older people were seen as custodians of customs and culture and or tradition, rendering them into family and

societal asserts for continuity and inheritance. Thus, the elderly were often consulted for their wisdom, and guidance.

It is a pain, however, to realise that these older people still remember the culture and tradition and they are willing to pass it on to the younger generation but the problem lies with producing speech. Therefore, the present study seeks to assist the older generation affected with Alzheimer's disease be able to produce and comprehend speech effectively.

1.6 Hypothesis

According to McCombers (2022), a hypothesis states one's predictions about what the current research will find. It is a tentative answer to the author's research questions that have not yet been tested. For some research projects, several hypotheses may be written to address different aspects of the research questions. A hypothesis is not just a guess- it should be based on existing theories and knowledge. It also has to be testable.

Alzheimer's disease patients have difficulty understanding language. This has been demonstrated in a number of procedures including enactment (e.g., Emery, 1983; 1988), sentence-picture matching (e.g., Rochon, Waters & Caplan, 1994), and the token test (e.g., Tomoeda, Bayles, Boone, Kaszniak & Slauson, 1990). Because these deficits occur in the context of multiple impairments such as dementia, it is not clear what is causing the language comprehension problem.

Deficits in lexical semantics, syntactic ability and memory, may all play a role. Since Alzheimer's disease patients are notoriously anomic and are impaired on a long range of semantic tasks (Bayles & Kaszniak 1987, Huff, 1988; Huff, Mack, Mahlmann & Greenberg, 1988; Kempler, 1995), it would be logical to postulate that semantic memory impairment underlies their sentence comprehension deficit.

 However, there are several reasons to reject this hypothesis. First, in contrast to naming, word comprehension appears to be quite well preserved in Alzheimer's disease (Kempler, 1988). Second, Alzheimer's disease patients appear to have difficulty understanding sentences, even when they demonstrate normal word comprehension (Small, Anderson & Kempler, 1997). There seems to be some contradiction in these findings.

On the other hand , Emery (1985) and Grober and Bang (1995) have argued that Alzheimer's disease patients' comprehension impairments is due to 'a genuine syntactic deficit' (Grober & Bang, p 95). This means that these patients have little or no difficulty understanding non-reversible passives, which can be understood, based on word meaning alone, but make errors on reversible passives that require syntactic processing for accurate comprehension.

Other researchers have taken an alternative position or route, namely that memory and other non-linguistic deficits underlie sentence comprehension impairments in Alzheimer's disease (e.g., Rochon, Waters & Caplan, 1994; Waters, Caplan & Hildebrandt, 1991; Waters, Caplan & Rochon, 1995). These authors have found that Alzheimer's disease patients' errors do not necessarily increase as syntactic complexity increases, as would be predicted by a syntactic deficit hypothesis. In their research, Alzheimer's disease patients performed no differently when comprehending simple active sentences versus syntactically more complex sentence structures of equal length. Rather, they found that semantic or conceptual complexity affected comprehension.

This study therefore hypothesises that Alzheimer's disease negatively affects the production and comprehension of speech, resulting in communication breakdown between carers and patients. This inability to communicate effectively strains the caregivers because they are unable to communicate instructions to patients, and they also cannot understand what the patients say when they speak. In addition, the medication offered for Alzheimer's disease is not easily attained; therefore, there is need for a non-medicinal intervention.

1.8 Significance of the Study

According to DiscoverPhDs (2020), the significance of the study is a written statement that explains why the research is needed. It is a justification of the importance of the researcher's work and the impact the research has on the field. The significance must stipulate the contribution of new knowledge and how others will benefit from it. This section states the importance of conducting this study. It signals who benefits from the research findings and how.

Language is a significant part of what makes us human, many linguistics departments offer a course entitled 'Language and the Brain' or 'Language and Mind', in the researcher's case the course was entitled 'Psycholinguistics.' Such a course examines the relationship between linguistic theories and actual language use by children and adults. Findings are presented

from research on a variety of topics, including the course of language development, language production and understanding (comprehension), and the nature of language breakdown due to brain injury. This study shall outline how the brain and language relate, hence helping those interested in this field to gain some knowledge.

From what the researcher has learned, scholars have identified two primary 'language centres' which are both located on the left side of the brain (the left hemisphere is language dominant). These are Broca's area, tasked with directing the processes that lead to speech utterance, and Wernicke's area, whose main role is to 'decode' speech. If a person experienced a brain injury resulting in a damage to one of these areas, it would impair their ability to speak and comprehend what is being said.

Therefore, this study shall have a positive impact on the helpers or carers of people with Alzheimer's disease in that it will shed light to cognitive reserve. The concept of cognitive reserve provides an explanation for differences between individuals in susceptibility to age-related brain changes or pathology related to Alzheimer's disease, whereby some people can tolerate more changes than others and maintain function (Stern, 2012).

Greater understanding of the cognitive concept could lead to interventions to slow cognitive ageing or reduce risk of dementia. From a medical/ pharmaceutical/ clinical perspective, Basotho may benefit from this study in that it will recommend different drugs that the United States uses as means of regulating Alzheimer's disease. There is an overall of 81 drugs for Alzheimer's disease, however, only four have been clinically approved so far (Klimova, 2015). There are research studies that prove a positive impact of these clinical drugs on Alzheimer's disease treatment, in this case, on language impairments, (Hilari et al, 2012).

In the United States, medication for Alzheimer's disease is in abundance and the patients are well taken care of. Even though there is medical attention in relation to Alzheimer's disease, in Lesotho, however, access to medical care is scarce as patients of Alzheimer's disease are supposed to fend for themselves if they are not under Mohlomi Hospital's wing. This means that for outpatients, it is difficult to find medication for Alzheimer's disease because the only pharmacy that sells such medication over the counter is Link Pharmacy, and it is sold for a huge sum of money and the pharmacy requires a proper prescription for such.

The Lesotho Policy for Older Persons regulated in 2014 aims to ensure that the older persons will be afforded access to health care services of high quality in order to promote good quality of life and wellness. However, this paper questions this policy and makes Basotho

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aware that older persons' healthcare is the least of the government's worries; because to date, Basotho older persons pay for their own medication since NETCARE left.

In South Africa, the maximum grant for persons above 65 years of age is R1990 per month, and R2010 for persons above 75 years, and dementia/ Alzheimer's disease medication is free at all local clinics but sold over the counter and at private healthcare facilities. This means the elders have money to afford them proper healthcare and are still given medication free at local clinics. This is however not the case with Mamohato Memorial Hospital in Lesotho because in Lesotho, the grant is below par, and the medication is scarce. This paper is a plea to the government to take care of our culture reserves (elders) whilst scholars or researchers find ways to make the Alzheimer's disease patients aware that there is light at the end of the tunnel. If the medication is made available to the patients, perhaps communication may be preserved.

This study will have a positive impact on the helpers or carers of people with Alzheimer's disease in that it has outlined what causes the barrier in communication- agitation, tiredness (see data presentation), and to avoid these, there are theories in chapter two that stipulate how behaviourism may help break the barrier.

1.9 Delimitations of the Study

Delimitations of a study are those characteristics that arise from limitations in the scope of a study and by the conscious exclusionary and inclusionary decisions made during the development of the study plan (Simon & Goes, 2013). The delimitations are those characteristics that limit the scope and define the boundaries of the study (ibid.). The researcher noted four delimitations for this study.

This study is only delimited to identifying phonetic dimensions affected in old people with Alzheimer's disease. These will be accomplished through the identification of distinctive features, characteristics of speech production and intervention measures that can be employed to improve production of speech in the individuals.

The delimitations are as follows:

1. The study is limited only to Age Care Facilities in Leribe and Maseru.

2. A sample population of around 20 old person is anticipated. The word 'anticipated' is used because numbers from the Age Care Facilities fluctuate.

3. This research has limited itself only on seeking older persons with Alzheimer's disease.

4. Only speech production and comprehension shall be looked into.

The aforementioned delimitations were determined prior to the data collection, the researcher considered the proposed timeline and duration of the study, budgetary constraints as well as the field of study in making the delimitations. The study is delimited to speech production and speech comprehension because speech production deals with producing speech sounds, while speech comprehension deals with grasping instructions, therefore, these are the cornerstones of communication.

1.10 Definition of Key Terms

1. Speech Production: Defining 'Speech Production' is complicated to say the least, however, Brain (2002) has tried to define it as a portion in both psycholinguistics and phonetics, which is concerned with how speech sounds are produced from the brain to the lungs back to the articulators. This means that, to say the simple three-letter-word, 'gap', airflow must be briefly halted by raising the back of the tongue to the soft-palate. This airflow is suddenly released, during which time the vocal cords must vibrate to create phonation. The tongue and jaw lower and the air should flow unobstructed to produce the proper vowel /æ/. The lips seal and the cords relax.

   For all the mentioned above to be articulated perfectly, it must be well orchestrated in time and sequence so that the word 'gap' results. Researchers also share the view that one of the basic mechanisms involved in Production of Speech is Activation Spreading. According to Hebb (1949), Activation Spreading is a metaphor adapted from brain research which is based on the neurological studies finding that neural networks consist of connected or interconnected neurons that exchange simple signals called activations via the connection they have with each other.

2. Broca's area: The Broca's Area is one important part of the brain, which must be taken into account when looking at or scrutinizing language-brain research. Broca's area in the human pre-frontal cortex and Wernicke's area in the temporal lobe are the

two most well- known cortical areas involved in the production and comprehension of speech, Chaplin (2020) states.

Broca's area is also known as the motor speech area. It is near the motor cortex and utilized in Speech Production, located in the inferior frontal gyrus; this area regulates breathing patterns while speaking and vocalisations required for normal speech. The anatomy of Language stipulates that the Broca's area is located in the left hemisphere and is associated with speech production and articulation.

3. Wernicke's area: For production or phonation, we have the lungs, trachea, and larynx.

   For articulation (to make the sounds into meaningful words) we have the soft palate, tongue, lips, and pharynx.

   The ability to articulate ideas as well as to use words accurately in spoken and in written language, has been attributed to this crucial area. For speech production to occur the Broca's must communicate or stimulate upper neurons located in the most lateral portion of the mortar cortex- we then need the larynx with the lungs- the lungs push air out, up through the trachea then the larynx (voice box). The cords will contract and recontract according to the sound produced. According to Cafasso (2019), the Broca's area has been found to be very active right before one speaks.

   Damage to a discrete part of the brain in the left frontal lobe (Broca's area) of the language dominant hemisphere has been shown to significantly affect the use of spontaneous speech and motor speech control. Speech may be labored and consist primarily of nouns, verbs or important adjectives. Speech takes on telegraphic characters. Telegraphic Speech by definition as according to Wimmer (2022) is a manner of speaking using a limited number of content words which are only considered relevant to conveying ideas or messages, examples may be *'Naledi come'*.

4. Speech Comprehension: McGettigan (2012) defines Speech Comprehension as a complex human skill, she further goes on to state that it is the performance that requires the perceiver to combine information from several sources of information to achieve an intelligible and interpretable percept. Speech comprehension is basically the ability to mentally grasp what is being heard or read. It is important to understand that for mute people hearing can develop their ability to comprehend speech without them being able to produce speech, so long as their basic intelligence is intact.

Language Comprehension is the ability to understand the different elements of spoken or written language, Gibbs (2021). Wernicke's area in mainly involved in the understanding and processing of speech and written language.

5. Alzheimer's disease: Cafasso (2019) posits that Karl Wernicke first discovered the Wernicke's area in 1876 and that it is located in the temporal lobe, just behind the ears. This region of the brain is in the left hemisphere and is responsible for speech comprehension. Damage to the temporal lobe may result in difficulty to understand language, speech is typically fluent but it is empty of content and is characterised by *Garden-Path Sentences, a high incidence of vague words like 'thing', sometimes neologisms or circumlocutions.*

There is quite a number of aphasias and apraxia, the more one reads on them the more they discover them, all these are caused by brain injury. Both aphasia and apraxia are caused by stroke or trauma to the brain, usually when the left side/hemisphere is affected; other less common causes are brain tumours and infections.

Widespread damage to the brain's language centres can result into global aphasia. People with global aphasia will have an extremely hard time expressing and understanding language. People with neurodegenerative diseases, such as Alzheimer's disease often experience loss of speech slowly over time- this is called Primary Progressive Aphasia (PPA). PPA is not Alzheimer's disease but can be a symptom of Alzheimer's disease. Unlike aphasia that results from stroke or brain trauma, PPA results from slow deterioration of one or more areas of the brain used in speech and language.

1.11 Summary of the Chapter

To begin with, the researcher has outlined a mini-initial review of literature of the study topic and nucleus of the research, Alzheimer's disease, in relation to speech production and comprehension. As the introductory chapter, this chapter had introduced the research problem as well as the evidence supporting the existence of the problem, and a layout of the study objectives which are very crucial in research as they must be related to the findings. The purpose of the study, the aim, as well as the significance have also been well articulated in this chapter. The researcher also presented the two research questions along with their

tentative answer (the hypothesis) and summed it all up by defining the necessary technical terms.

CHAPTER 2: LITERATURE REVIEW

2.1   Introduction

A review of literature is both a process and a product. As a process, McCombes (2023) defines it as a survey of scholarly sources on a specific topic. The review provides an overview of current knowledge, allowing the researcher to identify relevant theories, methods, and gaps which may be used in the current study. The review of literature involves searching for information related to the topic under study, allowing the researcher to be familiar with relevant research and identify issues and gaps in the research. Knopf (2006) supports this definition by stating that a review of literature summarises and evaluates a body of writings about a specific topic. This chapter is basically a writing process of summarising, synthesising and/or critiquing the literature found as a result of literature search.

Before going into the review, it is important to state that a review of literature is essential in every study because it helps a researcher to identify developments in the field of study, it makes the researcher alert of methodologies relevant or useful with the type of study they want to undertake and to identify gaps or niches in the literature that may help them build their research questions. A review of literature serves as an eye opener to researchers on what errors to avoid (McCombes, 2023), and it is important to those reviewing literature to highlight the strengths, weaknesses, and controversies in the field of study.

The researcher has decided to structure this chapter such that it reviews literature in subsections to avoid clustering themes altogether, and as per usual, the chapter shall end on a high note of the theoretical or conceptual framework

2.1.1 Alzheimer's Disease and Memory

This disease is one of the several causes of dementia, a brain problem that makes it difficult for patients to complete daily tasks without any form of aid from carers. For many people, the elderly in particular, Alzheimer's disease starts with a change in memory. This change in

memory has intrigued the researcher because without memory, much cannot be done, and communication cannot be carried out without active memory.

Arora and Sharma (2023) conducted a study investigating memory impairment. Their investigation was rather scientific, and a lot of scientific nomenclature shall be used in reviewing this study. To begin with, no humans were used to test memory impairment in the study, but transgenic mice were used as guinea pigs. A transgenic animal, according to Shakweer et at., (2023), a transgenic animal is one whose genome has been changed to carry genes from another species or to use techniques for animal genome editing for specific traits. Animal features can be changed by purposefully altering the gene or genes. In this study under review, the pair used double transgenic mice, which were originally obtained from The Jackson Laboratory, and were bred in the animal facility of National Brain Research Centre.

In as much as it may seem that animal rights were being violated in this study, Arora and Sharma have obtained consent from the Institutional Animal Ethics Committee. To carry on their experiment, the study would use mice from the colony, which were tested for the presence of the transgenes using the APP (Amyloid beta precursor protein) and the PS1 primers. Nine -eleven- month- old male mice weighted 20-40g, containing the transgenes (APP/ PS1, and wild-type (WT) mice without the transgenes were used for the experiment. Mice were kept under 12h light and 12h dark cycle in the animal facility, and the experiments were conducted during the day phase. Standard rodent chow (a formula recommended for rats designed to minimise their nutritional variables) and water were provided to the mice ad libitum.

The pair has used the Morris water maze task to study the spatial memory of the mice which resulted in showing that the APP/PS1 mice showed deficit in special memory. The researcher has no interest whatsoever in the animal brutality and methodology of the study, but the developments. It is worth noting that Alzheimer's disease is the most common in the geriatric population, and transgenic animals have been widely used to study the development of Alzheimer's disease. These animals have shown impairments in long-term potentiation and long-term depression (Mango et al., 2019). Mice overexpressing mutated human APP show amyloid deposition and impairment in learning memory (Games et al., 1995; Hsiao et al., 1996). Double transgenic mice with mutations in both APP and PSI show an accelerated rate of amyloid deposition in the brain (Borchelt, 1997). Although the APP/PS1 mice develop amyloid plagues and show impairment in memory (Xiao et al., 2016; Zhang et al., 2014) they

do not develop Alzheimer's disease- associated tau abnormalities as discussed in chapter one. Thus, the model the pair has deployed, the Morris water maze, does not fully recapitulate human Alzheimer's disease. However, the presence of amyloid plaques and cognitive decline make it a suitable model for studying Alzheimer's disease pathogenesis and for preclinical testing of potential therapeutic compounds.

Still on violation of animal rights and using mice as guinea pigs to test memory in Alzheimer's disease, Mestdagh and associates conducted a study in 2021 on how torpor enhances memory performance in a mouse model of Alzheimer's disease. Along with his team Mestdagh used hibernation to restore the memory. Hibernation is a state of inactivity during which animals undergo periods of extreme hypometabolism and hypothermia to escape energetically challenging environmental conditions (Carey et al., 2003). During hibernation, bouts of hypometabolism (torpor) typically last several days to weeks and are alternated with short periods of rapid restoration of metabolism to normal values (interbout arousals). Smaller species may use a different pattern of daily hibernation, during which they deploy 6-12 h of torpor on a daily basis, and effectively experience a full hibernation cycle of torpor and arousal within several hours (Ruf & Geiser, 2015; Geiser, 2013).

The study used difficult terminology for the researcher, but basically what the team hypothesised is that hibernation induces neurodegenerative-like changes in the brain, which are completely reversed upon arousal. They later discovered that hibernation-induced plasticity may be of great relevance for the treatment of neurodegenerative diseases but, this remains largely unexplored. Well, not that the researcher has any kind of interest in filling the gap and exploring how the hibernation may help mitigate the memory loss that has been caused by Alzheimer's disease. Rather, the interest is in the developments and techniques to use, not on animals, but humans. The study went on to show that a single torpor and arousal sequence in mice does not induce dendrite retraction and synapse loss as observed in seasonal hibernators. Instead, it increases hippocampal long-term potentiation and contextual fear memory. Interestingly however, the team later discovered that a single torpor and arousal sequence was also sufficient to restore contextual fear memory in an APP/PS1 mouse model of Alzheimer's disease. This current study has limited itself only on seeking older persons with Alzheimer's disease, not using mice as guinea pigs. Nonetheless, the above literature has helped identify the developments that have been made in trying to restore memory in Alzheimer's disease patients although human beings were not used.

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On real human beings with Alzheimer's disease, Vincze et al., (2020) presented a novel approach for the detection of mild cognitive impairment and mild Alzheimer's disease in the elderly. Their study first introduces that the diagnostic criteria of Alzheimer's disease and its prodromal stage (Mild Cognitive Impairment), have been known for a long time (American Psychiatric Association, 2013; Peterson, 2004). On the other hand, the diseases are said to remain undetected during the early stages since patients tend to ignore the first clinical manifestations.

Alzheimer's disease influences the temporal characteristics of speech (F. F Martinez-Sanchez et al., 2018; Fraser et al., 2016; Hoffmann et al., 2010; De Ipina et al.., 2015; Meilan et al., 2018, 2012, 2020; Toth et al., 2018) and these phonetic changes occur even in mild Alzheimer's disease (Forbes-McKay & Venneri, 2005; Kato et al., 2018; Konig et al., 2015; Laske et al., 2015; Misiewics et al., 2018) and in patients with mild cognitive impairment (Kato et al., 2018; Roark et al., 2011; Satt et al., 2014). In these earlier studies, quite different methods were used to obtain speech output needed for linguistic analysis. These earlier studies prompted the study by Vincze et al., (2020).

2.1.2 Tests Used in Memory Assessment

De Ipina et al (2015) aimed at reviewing and highlighting the most promising novel non-invasive and/or inexpensive screening and diagnostic tools such as neuropsychometric, clinical, blood and neuropsychological tests for early detection of Alzheimer's disease beyond the established clinical cerebro-spinal fluid analysis and neuroimaging dementia diagnosis. In the neuropsychometric tests, De Ipina et al (ibid) highlights the episodic memory tests. Episodic memory is the first and most severely affected cognitive domain in Alzheimer's disease and in prodromal stages including amnestic mild cognitive impairment (Backman et al., 2005). According to the investigators, several tests may apparently be used to assess the episodic memory such as the Logical Memory subtest from the Wechsler Memory Scale (Abikoff et al., 1987), the California Verbal Learning Test, now in its second revision (CVLT-II) (Delis et al., 2000), and the Free and Cued Selective Reminding Test (FCSRT) (Grober et al., 2000).

A comparison of the California Verbal Learning Test and Consortium to establish a registry for Alzheimer's disease-neuropsychological assessment battery has shown that the California Verbal Learning Test is more sensitive to preclinical changes in the episodic memory (Beck et al., 2012). The Free and Cued Selective Reminding Test free recall was more predictive than

the Wechsler Logical Memory immediate recall for identifying individuals with memory complaints who developed Alzheimer's disease over 2-4 years (Derby et al., 2013). Among a standardised neuropsychological battery, the FCSRT was also the most sensitive and specific test for diagnosis of prodromal Alzheimer's disease (Sazarin et al., 2007). In addition, the FCSRT better predicted the likelihood of an Alzheimer's disease-like Cerebrospinal fluid profile among mild cognitive impairment subjects than the Wechsler Logical Memory delayed recall (Wagner et al., 2012).

A large study examining members of families with dominantly inherited Alzheimer's disease was called the DIAN study. In this study, significant differences between mutation carriers and noncarriers were detected on the Mini-Mental State Examination (Folstein et al., 1975) and the Clinical Dementia Rating- Sum of Boxes (Morris, et al 1997). In the delayed-recall portion of the Logical Memory test (Morris et al., 2006), however significant cognitive impairment was found in mutation carriers, as compared with non-carriers, even ten years before expected symptom onset (symptoms of Alzheimer's disease have been discussed in the background). The Logical Memory test has also been used in prospective studies for sporadic Alzheimer's disease and has predicted Alzheimer's disease 10 years before its clinical diagnosis (Elias et al., 2000). Thus, use of an episodic memory test such as the Wechsler Logical Memory test or the FCSRT allows early detection of subtle cognitive deficits in both, familial Alzheimer's disease and sporadic Alzheimer's disease, favouring inclusion in one of these in a screening battery for detection on preclinical and early symptomatic Alzheimer's disease.

These tools are very important to the researcher because once again, they show new developments in the field and how people who do not have money may test for Alzheimer's disease. Another importance of this research is the investigation of lexical semantic memory (Belthazar at al., 2007). In cognitive tests, controls, amnestic mild cognitive impairment and mild Alzheimer's disease patients showed gradually decreasing cognitive ability. This indicates that verbal fluency might have been influenced by short term memory. In this context, short-term memory is used to refer to performance in memory tasks over a short period of time (Morris & Kopelman, 1986). A person's short-term memory is in constant use in his everyday life. It is used to remember what has just been read in the last sentence or where something was placed a minute ago. Short-term memory is very necessary for proper function because it affects many of the brain's most important and superior cognitive process.

2.1.3 Short-Term Memory

Studies of short-term memory in normal young adults and old adults have typically used three main experimental paradigms: free recall, immediate memory span, and the Brown- Peterson task (Brown, 1958; Peterson & Peterson, 1959). The Brown – Peterson task is a technique that tests one's short-term memory using trigrams (three- letter nonsense syllables). The task tests the participants' ability to recall and reproduce correctly the nonsensical syllables correctly after a specified delay interval. The typical finding when comparing short-term memory in young and old adults is that short-term memory only shows a modest decrement with increasing age (Bromley, 1958). These findings have been extended to include a population-based sample with normal older adults ranging from 75-95 years of age, as measured by the WAIS digital span (Amberla, Backman, Herlitz, Stigdoter, Viitenen, & Winblad, 1989).

Findings by Laukka (2006) show that the subjects were able to recall a list of words immediately after presentation. They were also likely to show the highest performance for items presented at the end. In one of the earliest studies on memory functions in Alzheimer's disease performed by Miller (1971), the findings are a very mild reduction in the recency effect (recalling items presented last). Miller used his presenile Alzheimer's disease patients. His findings were later replicated by Diesfeldt (1978) in a group of senile dementia patients.

A somewhat larger reduction of short-term memory was found by Martin, Brouwers, Cox and Fedio (1985), and by Wilson, Bacon, Fox, and Kaszniak (1983) using the Tulving and Colotla (1970) paradigm. In the Tulving and Colotla paradigm, items are recalled with less than seven items between presentation and the recall is said to reside in short-term memory. The small discrepancies in results may be due to different degrees of impairment in Alzheimer's disease patients as assessed by Pepin and Eslinger (1989). Pepin and Eslinger (ibid.) found that the serial position curves showed different slopes in mild, moderately and severely demented Alzheimer's disease patients. They showed similar recency effect as normal older adults whereas the moderately demented patients showed a markedly flatter curve and the severely demented an even flatter curve.

Short term memory is commonly assessed by studying the memory span. The longest list of items, which can be recalled in correct serial order. Memory span has been evaluated with digits, letters, words, or visual analogue (Milner, 1971). The results for mildly or moderately demented patients typically ranges from mild to moderate impairment, and more substantial

deficits for Alzheimer's disease patients are usually found on the Brown- Peterson task. In this task, the subjects are required to retrieve three items from their memory and say them out loud from memory, following short distractions. Corkin (1982) reported that even very mild demented Alzheimer's disease patients were moderately or severely impaired in this task. The extent of impairment was associated with degree of dementia, with the severely demented patients performing at the lowest level.

Morris (1986) varied the difficulty of the task from a simple tapping procedure to the adding of two single-digit numbers. He showed that the degree of deficit in Alzheimer's disease patients is related to the difficulty of the distractor test. There is a slight reduction in performance on the recency potion of free recall, a moderate and consistent reduction in immediate memory span, and a more substantial impairment on the Brown-Peterson task. Morris and Badderly (1988) interpreted these findings that Alzheimer's disease patients show normal phonological similarity effect, word length effect, effect on articulatory suppression, and normal rate of articulation. From this review, it is clear that short-term memory is impaired in patients with Alzheimer's disease. The impairment extends from verbal to non-verbal material, it appears to be mild during dementia and to increase with increasing severity of dementia.

2.1.4 Lexical Semantic Memory

Lexical semantic memory, as mentioned earlier is both short-term and long-term. Semantic long-term memory is typically described as a system necessary for the use of language, the organised knowledge a person possesses about words and other symbols, their meaning, referents, and relation among them, and about rules, formulas, and algorithms for the manipulation of the symbols, concepts, and relations. Semantic memory is also described by Tulving (1983) as one's knowledge about the world.

Rochford (1971) was the first to investigate the hypothesis that "in contrast to normal ageing individuals, Alzheimer's disease patients show a marked deficit in naming objects". He argued that demented patients misname objects because they misperceive them. This argument was based on the finding that many of the patients' mistakes concerned naming of visually similar objects, and on the fact that the naming ability was improved when the patients were asked to name easily discriminated body parts. There are also studies showing that the naming ability increases when the patients are allowed to handle the object, or if its use is demonstrated prior to naming (Barker & Lawson, 1968). Kirsher et al. (1984) varied

the perceptual difficulty of objects to be named by objects, photographs, and line drawings, and found that these manipulations had a much greater effect on the naming ability of Alzheimer's disease patients than on controls.

The results on these studies were interpreted such that Alzheimer's disease patients' naming deficit was due to a failure to identify the objects correctly. This view, however, leaves the current researcher questionable and there is a niche. If the patients were unable to name the objects due to lack of familiarity, this means that the Exemplar theory was not put unto test as a theory that helps in fossilisation of language, and it could have helped the participants to at least resort to using prototypes. Nonetheless, Barker and Lawson (ibid.) did try to put the prototypes into use when they demonstrated the objects prior to naming hence increasing the ability to name. In contrast to this interpretation by Kirsher et al (ibid.), there are studies reporting that the naming errors done by demented patients are rarely due to visual impairment, but rather semantically related to the object (Bayles & Tomoeda, 1983; Martin & Fedio, 1983; Schwartz, Marin & Saffran, 1979).

Huff, Corkin, and Growdon (1986) found that even when the demented group consisted of subjects who performed within the normal range on tests of perceptual discrimination, an impairment in naming could still be demonstrated. It has also been found that prompting Alzheimer's disease patients with definitions of the names that they failed to produce results in little enhancement in naming (Skelton-Robinson, & Jones, 1984.) Similarly, Flicker, Ferris, Crook, and Bartus (1987) found that demented patients who had difficulties naming an object could very seldom recognise the correct name, and Chertkow and Bub (1990) showed that a deterioration of detailed conceptual knowledge of the item disrupts the ability to name the item.

All these studies suggest the naming deficit in Alzheimer's disease is due to an actual loss or reduction in the availability of the specific semantic attributes that determine concept meaning (Nebes, 1989). Here, Nebes is referring to prototypes. Another line of reasoning leads to the conclusion that the semantics representation of the object is intact in Alzheimer's disease, but that the connection from this representation to its corresponding lexical representation is disrupted (Nebes, 1989, Smith Murdoch & Chenery, 1989). This reasoning or study informs the current research that the disruption may be fixable, so it is the aim of the current research to fix it, hence the second objective of this study on the exploration of explanatory treatments.

Evidence supporting this notion comes from studies showing that patients have greater difficulty with less frequent names than normal older adults do (Barker & Lawson, 1968; Kirshner et al., 1984; Skelton-Robinson & Tones, 1984). In addition, the semantic errors made by demented patients are largely associated with the function or the context of the object, which indicates that Alzheimer's disease patients possess knowledge of the function or context of the objects they could not name (Bayles & Tomoeda, 1983).

2.1.4 Alzheimer's Disease

Similarly, Martin and Fedio (1983) demonstrated that Alzheimer's disease patients were aided by phonemic cues on the Boston Naming Test. This again suggests that Alzheimer's disease patients have information about objects they are unable to name. Other aspects of language functions, such as comprehension, preservation, or spontaneous speech have been investigated to a much lesser extent than object naming and fluency. What is known is that demented patients show impairment in comprehension. This is where this current research comes in, to seek to find ways in which this comprehension may be preserved. This impairment is evident on the Token Naming Test (measuring the understanding of verbal instructions involving basic concepts of size, colour, and location), as well as reading comprehension task.

Comprehension in both spoken and written information is, thus, affected by dementia, although there is little evidence as to the nature of impairment. It is clear that Alzheimer's disease patients perseverate more frequently than normal ageing adults do, and that severity of dementia is correlated with perseveration (Bayles, Tomoeda, Kaszniak, Stern & Eagans, 1985; Shindler, Caplan, & Hier, 1984). Perseveration (the uncontrollable repetition of a word, gesture, or phrase) of ideas after an intervening response is typical for Alzheimer's disease patients, example; when describing a needle "its small, its sharp, its rather small" (Bayles et al., 1985).

Kopelman (1987) studied two types of confabulation. Confabulation is the art of replacing facts with fantasy in memory. In Alzheimer's disease patients have spontaneous confabulation, which may result from the frontal dysfunction as well as provoked confabulation, which may reflect on normal response to a faulty memory. When listening or talking to Alzheimer's disease patients, it is apparent that their speech tends to be vague, repetitive, and fairly empty of content words. In addition, Alzheimer's disease patients' language is filled with empty phrases, indefinite terms, and circumlocutions (Nicholas, Obler,

Albert, & Helm-Estabrooks, 1985), although the language remains grammatically correct (Hier, Hagenlocker, & Shindler, 1985).

The studies reviewed in this subsection have one trend which is the memory in relation to Alzheimer's disease patients. The studies have shown that when trying to preserve the memory, it always falls back, it is not a gradual graph of remembering what to say. They have, however, lead the current study to an epiphany that by constantly saying or naming objects, the mental lexicon registers it, and it is likely to get registered again, not to be forgotten.

2.1.5 Speech Production in Alzheimer's Disease

Producing speech sounds in rapid succession is one ability that humans take for granted. For this succession to be done, thoughts must be translated into linguistic representations which are then sent to speech mechanisms that can coordinate, initiate, modify and execute an utterance. The coordination of articulatory movements, an end stage component of speech production, has received increased attention in recent years.

Defining 'speech production' is complicated to say the least; however, Brain (2002) has defined it as a portion in both psycholinguistics and phonetics, which is concerned with how speech sounds are produced from the brain to the lungs back to the articulators. What Brain (2002) means here is that, to say the simple three-letter-word, 'gap', airflow must be briefly halted by raising the back of the tongue to the soft-palate. This airflow is suddenly released to let the /g/ sound, during which time the vocal cords must vibrate to create phonation. The tongue and jaw lower and the air should flow unobstructed to produce the proper vowel /æ/. The lips seal and the cords relax to proper articulate the voiceless stop sound /p/.

For all the mentioned above to be articulated perfectly, it must be well orchestrated in time and sequence so that the word 'gap' is produced. Researchers also share the view that one of the basic mechanisms involved in production of speech is activation spreading. According to Hebb (1949), activation spreading is a metaphor adapted from brain research that is based on the finding of neurological studies that neural networks consist of connected or interconnected neurons that exchange simple signals called activations via the connection they have with each other.

Patients with deficits in this ability or any ability to programme speech movements are said to have a disorder known as apraxia of speech. The disorder has been studied in the realm of

speech-language pathology, and treatment for the disorder has received equal attention (Wertz et al., 1984; Duffy, 1995; McNeil et al., 1997). There are several psycho- and neurolinguistic approaches to speech planning and production. Psycholinguistics studies on healthy individuals have indicated that differences in cognitive abilities and in the working memory may affect speech production and planning because speakers are able to adopt the scope of speech production planning depending on their cognitive abilities (Ferreira & Swets, 2002; Levelt & Meyer, 2000; Swets et al., 2014).

Another direction of research is the investigation of lexical semantic memory (Balthazar et al., 2007). In cognitive tests, controls, amnestic mild cognitive impairment and mild Alzheimer's disease, patients showed gradually decreasing cognitive ability. This indicates that verbal fluency might have been influenced by short-term memory. As the disease progresses, other cortical areas including the temporal cortex are involved, which could explain the deterioration of semantic knowledge in mild Alzheimer's disease. It has been shown that amnestic mild cognitive impairment impaired episodic memory, but the lexical semantic system was unaffected. Nonetheless, the latter might be affected, in the early phase of Alzheimer's disease. Deficits in language and memory functions, especially in semantic memory, are commonly found in patients even with mild Alzheimer's disease (Szatlocski et a., 2015).

Another study found that language and memory functions are impaired in Alzheimer's disease patients, since linguistic functioning requires proper memory functions. Difficulties in speech-production, speech comprehension and expression impose a decline in global speech performance , which hinders active vocabulary (Kempler, 2004). In the study, the relationship between certain language functions and cognitive impairment in Alzheimer's disease was estimated by the Mini-Mental State Examinations (MMSE) test. A significant relationship was found between MMSE scores and all language measures except hyper fluency, which is the ability to communicate efficiently without hesitation and unnecessary pauses. Impairment in language fluency is common, especially in the case of impaired cognitive and global performance (Weiner et al., 2008). The study has also shown that patients with both Alzheimer's disease and mild cognitive impairment have difficulties in performing tasks that require semantic knowledge, such as naming, and verbal fluency (Jarrold et al., 2014; Quaranta et al., 2019; Roark et al., 2011).

These symptoms appear early on and they increase during the course of the disease, suggesting early and progressive impairment of the semantic memory of patients (Nebes et al., 1989). However, according to a recent systematic review of connected speech changes in Alzheimer's disease as assessed by picture description tasks, results are more robust at later stages of Alzheimer's disease, but are more fragile and inconclusive at the mild cognitive impairment stage (Slegers et al., 2018).

Vincze et al (2021) conducted a study that was aimed at comparing the speech abilities of cognitively healthy elderly, patients with mild cognitive impairment and patients with Alzheimer's disease. More specifically, they sought to find out whether speech features indicating decline in the elderly could be used to diagnose the mild cognitive impairment group. Vincze et al (2021) hypothesised that a speech task involving episodic memory function (describing events from the previous day) results in a more reliable detention of mild cognitive impairment patients during the analysis of connected speech than film description tasks (Hoffmann et al., 2010; Lopez-de-Ipina et al., 2013; Toth et al., 2015).

A total of 75 participants took part in the study conducted by Vincze et al (ibid.), 25 mild cognitive impairment patients, 25 mild Alzheimer's disease patients, and 35 cognitively healthy controls. All the participants with mild cognitive impairment and mild Alzheimer's disease were right-handed and native speakers of Hungarian. The following clinical tests were applied to assess the cognitive state of the subjects: Mini Mental State Examinations (MMSE; Folstein et al., 1975; standardised in Hungarian by Janka et al., 1988), Clock Drawing Test (CDT; Manos & Wu, 1994), and Alzheimer's Disease Assessment Scale (ADAS-Cog; Rosen et al., 1984).

The entire test were carried out at the Memory Clinic at the Department of Psychiatry of the University of Szeged, Hungary. All procedures were performed according to the Declaration of Helsinki, with the approval of the University of Szeged Ethical Committee and Regional Human Investigation Review Board and written informed consent was obtained from all participants.

Afterwards, the participants were asked to talk about their previous day (*'previous day task'*). In the last task, the participants were shown another animation, which was followed by a one-minute-long silent pause, and then they were asked to talk about the second film (*'delayed recall of film description task'*). The duration of the silent break was determined in such a way that it could be successfully used in the case of mobile application in the future,

as well. The minute break was chosen instead of a distractor task, so that the cognitive load could be increased, without the need to focus on another task. The researchers obtained three audio recordings from each participant. The recording was performed with a digital voice recorder and a lapel microphone. After a careful listening, the recordings were transcribed both orthographically and phonetically. The researcher of this current study is however not interested in the findings if this study as its key interest is on mild cognitive impairment, the researcher is interested in the methodology.

Language production deficits occur early in the course of Alzheimer's disease. Studies have shown impairment in semantic fluency tasks and confrontation naming tasks (Taler and Phillips, 2008). This is usually attributed to word-finding difficulties and lexical-semantic impairment (Joubert et al., 2010). Other studies have analysed other language processes. Some have indicated that syntactic abilities are preserved in early Alzheimer's disease (Taler and Phillips, 2008) whilst others have not (Kempler et al., 1993). Most studies have stressed the fact that phonological capacities are relatively preserved in early Alzheimer's disease (Taler and Phillips, 2008). Nevertheless, most language assessment methods used in Alzheimer's disease patients are not specific to neurodegenerative disease but are derived from vascular aphasia batteries (Beland and Lecours, 1990). Moreover, more tests are unable to take into account communication and macro linguistic features.

Like single-word processing tasks, discourse impairment in Alzheimer's disease is often attributed to lexical-semantic impairment (e.g., de Lira et al., 2011; Gayraud et al., 2011). However, some authors have also observed not only lexical-semantic impairment but also macro linguistic impairment in Alzheimer's disease patients' discourse production (Ash et al., 2007; Brandao et al., 2013; Dijkstra et al.,2004).

While on macro linguistics, Pistono et al (2019) conducted a research aimed at analysing discourse production in early Alzheimer's disease; and to identify qualitative markers of macro linguistic decline, the authors (ibid.) recruited early Alzheimer's disease patients over 60 years of age. All participants were from the Outpatient Memory Clinic of the Neurology Department of Toulouse University Hospital (France). A group of healthy control participants was also recruited via retirees associations and posters in public places.

The local ethics committee approved their study, and all participants gave their informed consent. In language assessment, Piston et al (2019) used a system called GREMOT. The GREMOTs is a computerised language battery dedicated to early stage neurodegenerative

diseases (Bezy et al., 2016). This battery evaluates both oral and written language, production, and comprehension at different levels.

Phonological processing is assessed through non-word repetition, non-word reading and non-word writing under dictation. Lexical processing covers naming tasks (objects, actions, faces), word repetition, word reading, word writing under dictation, oral and written semantic verification. Syntactic processing covers sentence production, sentence writing under dictation, sentence repetition, orders execution and syntactic comprehension. Discourse processing is based on spontaneous language, interview, narrative discourse, oral and written discourse comprehension.

Pre and post inclusion assessments were either performed on the same day, or split into two days, depending on participants' preferences. Half of the Alzheimer's disease patients were assessed on the same day (pre inclusion and neuropsychological assessment in the morning and language assessment in the afternoon), while others were not. All control participants chose to be assessed on the same day. For Alzheimer's disease participants, each assessment lasted approximately two hours. For controls, each assessment lasted approximately an hour and a quarter.

For discourse analysis assessment, the researchers used transcribing and coding through the GREMOTs battery. For this task, participants were given the same task or instructions: 'here is a story depicted in five pictures. Tell me this story'. During the task, the experimenter remained neutral and avoided speaking in order to ensure uniform conditions for discourse production. Oral productions were recorded and orthographically transcribed with the Child Language Data Exchange System (CHILDES; MacWhinney, 2011). Using the embedded Computerised Language Analysis (CLAN) software program and its CHAT transcription norms.

Moving unto the macro linguistic assessment. Three levels of macro linguistic performance were analysed: informativeness, global coherence and local coherence. Some of the measured variables were considered as improving the discourse macro linguistic level (i.e. logical connectors), while others were considered as indicating macro linguistic impairment (i.e. misinterpretations).

For this qualitative assessment, interrater agreement was measured by comparing two experimenters' ratings, one by the author and another by a psycholinguist who was involved in the study. More precisely, each transcriber first individually assessed the discourse. Then

they compared their analyses and resolved any discrepancies, never above 1%, until they reached 100% agreement. This agreement was measured for all discourses.

In the findings, a total of 17 Alzheimer's disease participants and 17 cognitively normal individuals (controls) were included in the study. The study showed that Alzheimer's disease participants experienced difficulties in discourse production. They presented macro linguistic changes, mostly declines in informativeness and global coherence. Moreover, macro linguistic and cognitive performance were correlated. These results emphasise the usefulness of picture-based narrative in revealing cognitive impairment in an ecological way.

Research on the comparison of the production of expressions in Parkinson's disease patients and Alzheimer's disease patients was also conducted. It was based on formulaic expressions. Clinical descriptions of formulaic expressions in aphasic speech have flourished for more than 150 years under a wide variety of terms. Formulaic language, in its modern conception, as stipulated by Sidtis et al (2015), consists of fixed, unitary expressions known to a language community with their characteristic form, meaning, and usage conditions.

Typical examples of formulaic expressions are controversial speech formulas :

- 'you betcha'
- 'you've got to be kidding me'
- 'say what'

Expletives:

- 'hack'

Proverbs:

- 'when it rains it pours'
- 'all things being equal in the meantime'
- 'the long and the short of it is'

According to Altenberg (1998), Biber (2009), Kuiper (2004), and Wray (2002), these expressions share the features of fixed or canonical form; they are conventionalised and often have a nonliteral meaning; and specific relations to discourse context.

In this study of Sidtis et al., (2015) currently under review, they examined two hypotheses. First, it was predicted that persons with damage to subcortical structures would have diminished proportions of formulaic expressions in their spontaneous speech when compared

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with healthy speakers. This hypothesis was tested by examining naturalistic speech samples obtained from persons with a diagnosis on Parkinson's disease, which is characterised by dysfunctional basal ganglia. A corollary prediction related to this hypothesis was that subcortical disability affects production and not comprehension or knowledge of formulaic expressions.

The second hypothesis stated that persons with cortical dysfunction pursuant to a diagnosis of probable Alzheimer's disease would reveal the converse picture: abundant production of formulaic expressions coupled with deficient meaning comprehension. That is, the second hypothesis predicated that persons with cortical damage would have elevated proportions of formulaic expressions in their spontaneous speech when compared with healthy speakers but that relative failures of cognition and comprehension would emerge. This hypothesis was based on the fact that the basal ganglia are intact far into the progression of Alzheimer's disease along deteriorating cortical structures.

The studies were performed on native speakers of American English, which the authors have defined as having spoken English since infancy, having at least one native English- speaking parent (usually both parents) in the home, and having been educated since preschool in the United States. All participants had hearing and vision (with correlative lenses) within normal limits of self-report. Sixteen persons diagnosed with idiopathic Parkinson's disease (six women, ten men) with a mean of 66.7 years (range = 46-81 years) and a mean of 16.7 years of education (range =12-21 years) were recruited, consented, and were tested following institutional review board procedures. All were right handed except for one participant of unknown handedness.

Ten persons (nine women, three men) diagnosed with probable Alzheimer's disease, all right handed, with a mean age of 77.9 years (range 57-90 years) and a mean of 14.2 years of education (range = 11-18 years) were recruited in Sidtis et al (2015) study, consented, and were tested following institutional review board procedures.

Recruited participants were from a larger pool of individuals who underwent assessment of memory and cognitive status through the Memory Education and Research Initiative at the Nathan Kline Institute. Eighteen individuals (12 women, six men) with a mean of 69.9 years (range= 50-83 years) served as the healthy control comparison group. Years of education were recorded for all but one participant, yielding a mean of 15.4 years of education (range

=12-20 years). All but two participants were right handed and, following extensive screening regarding their background, non-reported previous neurological or psychiatric conditions.

A structured interview in which the examiner followed a script of topics was used to elicit speech samples from participants. The examiner asked open-ended questions such as 'could you tell me a little bit about yourself?' and 'what do you remember most about your days in high school?' The participants were all asked to answer freely and as naturally as possible. Responses were audio recorded without any time restrictions, and the interviews typically lasted 8 to 12 minutes.

Two native English speaking trained research assistants then transcribed speech samples. A third member of the research team mediated any differences in transcriptions. Upon obtaining a total word count of the participants' responses, two other raters- also native speakers of American English- identified all formulaic utterances within each transcription, and all differences in categorisation were systematically discussed and agreed upon by both raters.

Formulaic expressions were identified by native speakers from knowledge and intuition, and selections were verified using formal and functional criteria. Formulaic language was identified and categorised into six categories:

1. Conversational speech formulas '*nice to see you again'*,
2. Conventional expressions *'as it were'* ,
3. Pause fillers *'like,' 'ya know''* ,
4. Discourse elements *'well', 'so',*
5. Sentence stems *'I guess'* ,
6. And idioms and proverbs.

For this study, categories were collapsed. Proportion of words in formulaic expressions was obtained by dividing the total number of words in formulaic expressions by the number of words in speech sample for each participant.

Midway through the structured interview, the examiner asked participants to 'remember some old sayings' during which the examiner said the first part and the participant was prompted to complete the last one or two words of the formulaic expression. For instance, the examiner said 'footloose and …' and the participant replied with '…fancy free'. Ten familiar sayings were introduced to the participants in this manner, and participants' responses were recorded.

Age and education comparison for the three groups revealed a significant difference in age between the healthy control and Alzheimer's disease groups and between Parkinson's disease and Alzheimer's disease groups but not between Parkinson's disease and healthy control. For education, the Parkinson's disease and Alzheimer's disease groups differed significantly, with the Parkinson's disease group having a higher mean education.

The results showed the Parkinson's disease group having lower proportions of formulaic expressions compared with the Alzheimer's disease group and Healthy control groups. Comprehension testing yielded opposite contrasts: participants with Parkinson's disease showed significantly higher performance compared with participants with Alzheimer's disease and did not differ from healthy control participants.

2.1.6 Speech Comprehension in Alzheimer's Disease

Communication is defined by the National Joint Committee (NJC) for the communication needs of persons with disability as 'any act by which one person gives to or receives from another person information about that person's needs, desires, perceptions, knowledge or affective states'. Communication may involve conventional or unconventional signals and take linguistic or non-linguistic forms and may occur through spoken or other modes of communication (Brady et al., 2016).

As Banovic and Sinanovic (2018) put it, the communication abilities of older adults with Alzheimer's disease gradually decline as the disease progresses. Declining communicative abilities may influence the quality of patients with Alzheimer's disease and their carers, and can compromise the quality of life of these adults and present challenges for their caregivers (Guendouzi et al., 2017).

According to the Alzheimer's Association (2017), Alzheimer's disease is the largest global contributor to cognitive decline and dementia. It is identified by memory and intellectual ability loss that interferes with daily activities. Since the number of older adults is growing, the number of people living with dementia is also expanding (Spencer, 2017). Worldwide, around 50 million people have dementia, and there are nearly 10 million new cases every year (WHO, 2020).

In Thailand, the recent data from the National Health Examination survey showed that the prevalence rate for dementia among the elderly population was 8.1% (Prasartkul, 2017). Difficulties in area of language are a common symptom in people with Alzheimer's disease

(Pistono et al., 2019), such communication impairments may be very challenging for people involved in care of such patients. Such difficulties occur because of brain function and cognitive impairment (Watson, 2018) that arises as deterioration in working memory impairs the ability to keep hold of and use information during conversation.

As Banovic (2018) writes, during the beginning phase of Alzheimer's disease, people may not be able to find specific and familiar words to describe or explain something, or may develop new words to express their ideas to others. In addition, the conversations of adults with Alzheimer's disease may often seem repetitive and difficult to follow (ibid.), making it difficult to sustain the everyday conversation that supports the patients' social relationships (Kindel et al., 2017).

Care for adults with dementia in Thailand is generally provided by family caregivers (Ondee et al., 2013) because of gratitude, which is an essential value in the Thai worldview, according to Persons (2016). However, Thailand lacks sufficient long-term care institutions to meet the needs of dependent older adults within an appropriate socio-cultural context. Komjakraphan and Karuncharerpanit (2021) conducted a research on experiences of communicating with older adults with Alzheimer's disease.

Their study aimed to explore, interpret and describe the lived experiences of Thai family caregivers regarding their communications with the patients. Their study was conducted in the interpretive paradigm of hermeneutic phenomenology. According to Gadamer (1993), all humans are part of history, and it is not possible to step outside history and look back at the past objectively. Van Manen (1997) suggested a framework for hermeneutic phenomenological study, and it was therefore used to guide their study.

 To achieve the aim of the study, a research question 'what are the lived experiences of family caregivers in daily life communications with older adults with Alzheimer's disease?' was asked. For the purpose of this research, communication in daily life was defined in broad terms as any form of interaction between family caregivers and older adults with Alzheimer's disease. A purposive sampling based on inclusion criteria was used to recruit participants with the expectation that they would provide unique and rich information of value to the study. This sampling technique intrigued the current study. In relation to ethics, ethical approval for the study was obtained from the Health Science Human Research Ethics Committee.

Written permission to conduct this study was also obtained from the directors of the target hospital. All participants were informed about the purpose of the study and informed consent was obtained at the time of the interviews. The participants were free to leave the study at any time if they wanted, and if they recounted stressful incidents during an interview, they could talk through any issues with the researchers afterwards in accordance with their wishes. All data were kept confidential and individual privacy ensured in the writing.

Data were collected through semi-structured interviews, conducted from November 2018 to June 2019 by the Principal Investigator in participants' homes due to personal preferences. The interviews were guided by participants' responses to help them explore the topic and probe for further thoughts and reflections. Techniques used to engage the participants included funnelling from broad open-ended questions to narrower topics, probing to elicit further details and encouraging storytelling. An example of such open-ended question included 'Please tell me about communication encounters you have had in daily life with the person under your care.' and 'what do you consider to have been satisfactory and unsatisfactory communication with them?'

More specific questions complemented the more generalised questions (could you please tell more in detail? Could you give some examples of this?), as well as open-ended questions such as 'what is it like to deal with a person with Alzheimer's disease under your care?' were used to stimulate reflection and descriptions of experiences related to communication issues. All participants were encouraged to express and reflect their feelings in their own words. The interviews were audio-recorded and lasted 45-60 minutes. After each interview, as means of data analysis, the recording was transcribed verbatim and analysed separately by using the three approaches for isolating thematic statements: 1. The detailed reading approach; 2. The selective or highlighting approaching, and 3. The holistic reading approach as suggested by Van Manen (1997).

The participants, all female, were recruited from two hospitals located in the southern region of Thailand. Most were single, and half had received a bachelor degree or higher. The participants outlined several problems when they tried to communicate with their relatives. Their daily communication experiences of engaging in troublesome communication portrayed interpersonal conflicts and less flexibility in communication style of the older adults.

According to the researchers, Komjakraphan and Karuncharerpanit (2021), interpersonal conflict is a natural outcome of human interactions, this occurs between caregivers and patients when they disagree over information. The participants described a tendency to engage in aggressive manners of the patients when they were provoked in ordinary situations. The aggressive manners were perceived as engagement in acts of defiance, failure to listen to others and expressions of dissatisfaction and anger by shouting and using bad or swear words. From the study, participants stated that there are difficulties in communication. They described that their relatives' words or actions were incomprehensible. The researchers (Komjakraphan & Karuncharerpanit, 2021) noted that the participants said

'I have no idea…he said nothing…He made no choice…He can't speak anymore. In the past, even when he said something and we tried to learn or listen to it, we could not understand his words. Now, he rarely speaks, not even once, for things like asking for water or food to drink or eat.'

'Sometimes he says things like, 'I go, I go' but does not finish his words, I don't know where he wants to go or what he means by those words.'

Feelings of difficulty in communication are also referred in their relatives' speech errors, including repeated words and repetitive story telling.

'She kept asking me or my father when I would go for a meeting (in another province) and when I would come back. I told her two weeks ahead of time and marked the date on the calendar for her to see, but she kept asking over and over, nearly every day.'

'Sometimes, I wouldn't be able to sleep because she crawled over and woke me up. She called me 'mom' and asked about her husband (my father). Even though I told her the truth that he has already passed away and we had just gone to the cremation ceremony together, she rejected my explanation and kept saying 'No, he is alive' for the whole night.''

Some participants stated that misuse of language and inability to provide clarification was an obstacle to understanding or relating to each other. Occasionally, everyone has trouble finding the right words, but people with Alzheimer's disease often forget simple words or substitute unusual words, making speech errors that are hard to understand.

> *'She said she wanted to eat something but she couldn't tell me the right things. She said something yellow…chicken. It took me a week to figure it out that what she wanted was chicken biryani.'*

The quoted words are lived experiences of participants while they were communicating with the patients of Alzheimer's disease. The communication technique suggested as an effective way to solve communication problems between carers and patients, as according to Komjakraphan and Karuncharerpanit (2021), was compliance or 'going with the flow'. Arguing would increase agitation and may lead to emotional strain on the relationship.

Compliance in this case of communication was perceived by family caregivers as agreeing with any made-up stories or explanations from the elders. Most participants agreed that if no technique seemed to be working or being successful, distraction or diverting the attention of the elders to other topics or a combination of the techniques would be helpful. Some participants also suggested using a therapeutic lie to gain cooperation

> *'I told her we were going out for dessert that she liked and she was willing to go out. Then I'd stopped by for a doctor's appointment before the dessert and it worked.'*

All the communication strategies and techniques of showing respect, compliance, distraction, and therapeutic lies were considered as effective ways for solving communication problems between the caregivers and the older adults with Alzheimer's disease. Communication with older adults with Alzheimer's disease can be challenging because of their cognitive impairment (Ondee et al., 2013). From a study conducted by Komjakraphan and Karuncharerpanit (2021), there were two themes from the findings that are associated with the caregivers' experiences of communication with adults with Alzheimer's disease; the first theme is 'Engaging in troublesome communication' and the second one is 'Inability to relate to each other.'

Alzheimer's disease patients become frustrated when they cannot articulate what they want or how they are feeling, Banovic et al (2018) explains that is because Alzheimer's disease affects the brain, hence the patients appear to use simpler, less flexible and more direct encoding system. It makes sense that, defiance, and irritability may be the only behaviours they use when they cannot articulate what they want or what they are feeling.

Language impairment is usually one of the first cognitive signs of the onset of Alzheimer's disease (Klimova et al., 2015). The patients in this study experienced increasing word finding

and language comprehension difficulties as the disease progressed. With more cognitive decline, they were unable to remember or understand what their caregivers had said. The participants mentioned verbal repetition, such as repetitive questions, storytelling, talking on one topic and repeating words amongst the behaviours giving them the most trouble.

However, in as much as Komjakraphan and Karuncharerpanit (2021) have fully explored how comprehension is triggered in patients with Alzheimer's disease, their study has lead this current research to be intrigued into adopting their methodology in relation to ethics and transcribed verbatim.

2.2   Conceptual Framework

A conceptual framework includes one or more formal theories, in part or in whole as well as other concepts and empirical findings from the literature. Conceptual frameworks are commonly seen in qualitative research on the social and behavioural sciences, often because one theory cannot fully address the phenomena being studied. The conceptual framework serves as a guide and ballast to research (Ravitch & Riggan, 2016), functioning as an integrating ecosystem that helps researchers intentiaonally bring all aspects of a study together through a process that explicates their connections, disjunctures, overlaps, tensions, and the content shaping a research setting and the study phenomena in that setting. As a qualitative researcher, it is essential to understand what a conceptual framework is, what its components parts are and how they interact, and how it is used to guide high-quality, rigorous qualitative research.

Conceptual frameworks have historically been a somewhat confusing aspect of qualitative research design. A conceptual framework makes the case for why a study is significant and relevant and for how the study design (including data collection and analysis methods) appropriately and rigorously asnwers the research questions. In addition, Ravitch and Riggan (2016) highlight the ways that a conceptual framework supports how a researcher locates and perhaps argues for their research in terms of its newness and contribution to a field of inquiry, perhaps new questions, new context. The conceptual framework serves as the compass, the landmarks and the navigation system of the research apparatus.

A central component of a conceptual framework is the theoretical framework, which is an intergrative narrative that consists of formal or established theory. The conceptual framework is a 'dynamic meeting place of theory and method' and so helps researchers consider the roles that existing, or formal, theory play in the development of research questions and the goals of the study as well as throughout the entire process of designing and engaging in research (Ravitch & Riggan, 2016, p. 141). The critical integration of formal theory- the set of established theories that are combined in relation to the researcher's way of framing the core constructs embodied in research questions, constitutes the study's theoretical framework.

The formal theories that have been taken into account in the study is the Exemplar theory and BF Skinner's Behaviorism.

Pierrehumbert (2001) averts that the Exemplar theory assumes that speech perception and production are closely linked to each other in a perception-production loop. All percepts of speech events are stored in memory as exemplars in a perception-state. Pierrehumbert (2001) summarises the theory by stating that, in exemplarism, a category (a phoneme) is represented by a cloud of numerous exemplars (tokens or instances) of the category. Strongly similar instances are close together. Stored exemplars present all the variation that occurs in the physical correlates of the category. Exemplar models were originally proposed for phonetics and phonology as a result of attempts to understand how speakers recognize familiar voices (Bybee & Cocoullos, 2008). In exemplarism, every token of use is registered in memory; if an input token is the same as an existing exemplar, it is mapped onto that exemplar, strengthening it. If it is not similar enough for a mapping to an existing exemplar, a new exemplar is established, positioned in a metaphorical space close to similar exemplars (Bybee 2001, Pierrehumbert 2001). Thus for every word or phrase in a speaker's lexicon, there is a cloud or cluster of phonetic exemplars.

Moreover, the meaning of the word or phrase is also represented by a cluster of exemplars which represent the context and meaning for each token of a word. It is proposed that memory for linguistic objects is the same for non-linguistic, which means that memory can also decay. Particular exemplars that are marginal and non reinforced may be lost, keeping word categories more centred (Wedel 2007, Pierrehumbert 2003). Exemplar models provide the formal representation for usage-based grammar, which views linguistic structure as emergent from language use. Usage leads to different degrees of conventionalisation of discourse patterns, from "reusable fragments" (Thompson 2002, p.141) or "prefabs" (Erman

& Warren 2000) to more generalised and schematic constructions. Since tokens of experience are registered in memory, specific instances of constructions are represented in exemplar models.

The model of lexical associations proposed for morphologically complex words in Bybee (1985, 1988, 2001) can be extended to multiword units as associations made amomg related forms are gradient and depend upon the degree of semantic and phonological similarity and the token of frequency of the specific items. In exemplar models, the representations of constructions consist of categories that group together all the exemplars of a given construction, based on semantic and formal similarity. One of the main determinants of memory storage is frequency in experience; thus specific instances of constructions may occur as units in memory storage, even if their meaning and form is predictable from the more general construction.

The advantages of the exemplar theory is that for a phonetic category, extreme exemplars are sometimes judged better than ones located at the centres of the cloud. Thus, for vowels /i/ and /u/ the best exemplars, according to speaker judgements, have more extreme formant values than the ones associated with more typical productions. Here is why the model accounts for this observation: seeing that its attribution of a category is contrastive with others, the distance of a candidate from all exemplars of competitor categories increases its subjective goodness. What accounts is not that it is a good /i/, but rather that would be a very bad /u/. Furthermore, the acquisition of phonetic and phonologic knowledge is the acquisition of a larger number of exemplers. The model has a better descriptive adequacy than its competitors. A universal symbolic alphabet (Chomsky & Halle 1968, Chomsky & Lasnik 1995) does not represent the fine differences which language make between the values and the distributions of phonetic properties and it does not tell how they are acquired.

In addition to the advantages, in exemplarism, a token located at the centre of a cloud is recognised in the category, even if there is no exemplar for the category exactly at the centre of the cloud. Thus, there is no need to reify a prototype. The advantages of the exemplar theory play a role in this study as they help the researcher achieve the objectives. The ability of the theory to represent fine differences in language and make distributions in phonetic properties shall assist in meeting the first objective "to identify phonetic dimensions affected in the production of speech through the identification of the distinctive features". The second objective "to explore whether Basotho in Age Care Facilities have any interventions as

explanatory treatment for poor speech production and comprehension in Alzheimer's disease, for the betterment of patient-carer relationship" somewhat corrolates with Lavie (2007) such that each stored exemplar has a strength which is persistent activation. The more recent and more frequent exemplars are stronger. There is, however, a likelihood that the patients of Alzheimer's disease may not adhere to paying attention to what is being said in order to register the exemplars, in this instance, BF Skinner's Behaviourism comes in.

In the thirties, Skinner (1931) demonstrated that behaviour traditionally viewed as spontaneous or voluntary could be shown to be lawful. At that time, order meant reflex, and the reflex are served as the conceptual unit for analysis of behaviour by Watson, Hull and the researcher has adapted them in the analysis when observing the behaviour of the elders in answer to the objective of identifying the role of exemplars in speech comprehension.

CHAPTER 3: METHODOLOGY

3.1 Introduction

A research methodology may be understood as a science of studying how research is done scientifically. In it, the various steps that are generally adopted by a researcher in studying the research problem along with the logic behind them are studied. Research methodology is a way to systematically solve the research problem (Kothari, 1990). In the case of this study, what was being investigated or identified is the inability to communicate between carers and the patients.

It is necessary for the researcher to know not only the research methods or techniques, but also the methodology. Creswell (2003) also defines research methodology as a systematic way to solve a problem. It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about in their work of describing, explaining, and predicting phenomena, are called research methodology. Its aim is to give the work plan of research, its importance is more or less the same, it helps the researcher plan his research.

Researchers not only need to know how to develop certain tests and calculations, how to apply particular research techniques, but they also need to know which of these techniques or methods are relevant and which are not, and what they mean and indicate why (Creswell,

2003). Researchers also need to understand the assumptions underlying various techniques and they need to know the criteria by which they can decide that certain techniques will be applicable to certain problems and others will not.

Research problems differ from problem to problem, the problem for this research is basically the communication breakdown between carers of Alzheimer's disease and the patients. All this means that it is necessary for the researcher to begin his methodology for his problem. Research methodology according to Kothari (1990) has many dimensions and research methods do constitute a part of the research methodology. The scope of the research methodology is wider than that of research methods. Thus, when one talks of research methodology, they do not only refer to the research methods.

Nevertheless, they also consider the logic behind the methods they use in the context of their research study and explain why they are using a particular method they use in the context of their research study. They also explain why they are using a particular method or technique and why not others so that research results are capable of being evaluated either by the researcher himself or by others (Kothari, 1990). The formidable problem that follows the task of defining the complexity of a research methodology is the preparation of the design of the research project, popularly known as the 'research design'.

3.2 Research Approach

A research approach is a procedure selected by the researcher to collect, analyse and interpret data. Hassan (2023) defines a research approach as a systematic and structured way in which a researcher used to conduct research. There are three research approaches, namely: qualitative research approach, quantitative research approach, and mixed methods approach. This study has used mixed methods.

3.2.1   Qualitative Research Approach

 When a researcher wants to determine or check the presence or absence of an element, in the study, qualitative methods are used (Solanki, 2022). Researchers employ qualitative research methods to study human behaviour and habits. In the qualitative research methods to study human behaviour and habits. In the qualitative approach, the activities of collecting and analysing data, developing and modifying theory, and elaborating or refocusing the research

questions, are usually going on more or less simultaneously, each influencing all of the others for a useful model of qualitative research design, (Lingard, 2015).

Qualitative research is an approach in social research according to which the study takes its departure point as the insider perspective in social action (Babbie and Mouton, 2010). Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretative, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, conversations, recordings, and memos.

Qualitative approach involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret phenomena in terms of the meanings people bring to them (Denzin & Lincoln, 2005). For the first objective of this study to be met, qualitative design was used to identify the phonetic dimensions through distinctive features and gave a clear indication of the problem at hand.

This study used a healthy reserve and people with Alzheimer's disease as the sample. Therefore, to compare the two different samples, the researcher had to adapt to the quantitative research design.

3.2.2 Qualitative Research Approach

Quantitative research approach is the standard experimental method of most scientific disciplines. According to Coghlan and Brydon-Miller (2014), this approach refers to a set of strategies, techniques and assumptions used to study the psychological, social, and economic processes through the exploration of numerical patterns. The purpose of quantitative research is to generate knowledge and create understanding about the social world. Qualitative research is used by social scientists, including communication researchers, to observe the phenomena or occurrences affecting individuals. Through this design, it is how we learn about a particular group of people, known as 'same population'.

In an article by *djs research* , quantitative design methods vary, could be data collected by telephone interviews, face-to-face interviews, online surveys, or surveys by post. Other methodologies include text message surveys or physical counts, in this account the researcher had used focus groups aimed at discovering how many people think, act, or feel in a specific

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way. Quantitative projects involve large sample sizes, concentrating on the quantity of responses.

This study used the mixed methods research design being qualitative and quantitative. The researcher opted for the mixed methods because through it, she was able to get the detailed information on distinctive features through speech production and comprehension of Alzheimer's disease patients. Also, she was able to see and identify the characteristics of speech production and comprehension in healthy reserves as well as in people with Alzheimer's disease. In addition, through the design, the researcher was able to get the generalised, externally valid insight of the numerical data.

3.3 Research Design

Decisions regarding what, where, when, how much, by what means concerning an inquiry or a research study, constitute a research design. This is a plan and procedure for research that spans from broad assumptions to detailed methods of data collection, analysis, and interpretation. Solanki (2022) defines research approaches (or research designs) as the collection of procedures and plans that decide the overall process of research.

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Selltiz, et al., 1962). The research design is the conceptual structure within which research is conducted. Research design is needed because it facilitates the smooth sailing of the various research operations, thereby making research as efficient as possible yielding maximal information with minimal expenditure of effort, time, and money.

Selltiz, et al., (1962) further go on to state that a research design has a great bearing on the reliability of the results arrived at and as such constitutes the firm foundation of the entire edifice of the research work. A good research design is often characterised by adjectives like flexible, appropriate, efficient, economical, and so on, the design that minimises bias and maximises the reliability of the data collected and analysed is considered a good design.

Different research designs have been conveniently described by categories (1) research design in case of explanatory research studies, (2) research design in case of descriptive and

diagnostic research studies, and (3) research design in case of hypothesis-testing research studies.

3.3.1 Research design in case of descriptive and diagnostic research studies

The current research used descriptive research design, descriptive research describes what exists and may help uncover new facts and meaning (Polit & Hungler, 1999) . The purpose of descriptive research is to observe, describe and document aspects of a situation as it naturally occurs. In this research, the researcher has observed the behaviour of the population, described what they had gathered in themes and thereafter documented everything as required in the fourth chapter. This involved the documentation of data that provided an account or description of individuals, groups, and situations.

McCombes (2019) states that a descriptive research answers *what, where, when, and how* questions. It is usually used in qualitative research. However, in diagnostic studies, Romanchuk (2023) stipulates that this type of research determines the root cause of the problem and finds the most effective solution. It is often used in marketing the identity areas of the improvement or potential opportunities for growth, and it is linked with qualitative design. This current research uses mixed methods, in as much as it still answered the w&h questions, statistics were also taken into consideration.

3.4 Population and Study Location

In research, population is the entire group that one wants to draw conclusions about (Bhandari, 2023). A population can be made up of anything one wants to study- plants, animals, organisations, texts, countries. In this study, the population was elders (above 65) with Alzheimer's disease and elders (above 65) without Alzheimer's disease, form Old Age Homes. The reason the researcher chose Alzheimer's disease patients and healthy reserves or normal aging adults was so they could compare and contrast the distinctive features.

In order for the objective, 1. To identify phonetic dimensions affected in production of speech through the identification of the distinctive features to be met, the researcher was urged to take a normal aging adult and study his speech comprehension and production and identify the dimensions. The results were then to be compared to the patient of Alzheimer's disease so there could be a notable distinction.

In relation to geographical statuses, the researcher chose two different institutions to avoid biased data because they are from two different geographical spheres. The institutions were chosen using convenience sampling. The researcher used the sample in Leribe, Pitseng, which is in the Northern side of Lesotho; and another sample was drawn in Maseru, Mazenod, in the West side of Lesotho. In Leribe, the sample was made up of four patients of Alzheimer's disease, while in Maseru, Mazenod, it was four patients of Alzheimer's disease and one healthy reserve. The sample was not chosen to say the least, it is the number of people the researcher found at the shelter (s). In this study, the normal control is referred to as healthy reserve because the researcher had adapted the nomenclature from the literature earlier reviewed. Vincze et al.,(2021), Pistolo et al.,(2019) as well as Sidtis et al., (2015) had used the term in their studies on Alzheimer's disease.

3.5 Sample and Sampling Techniques

In qualitative research, there are various sampling techniques that researchers use when recruiting participants. In this research, purposeful sampling was used to select the facilities for the participants, both normal aging adults and patients of Alzheimer's disease. Purposeful sampling is a sampling technique widely used in qualitative research for the identification and selection of information-rich cases for the most effective use of limited resources (Patton, 2002).

The researcher chose this technique because in Lesotho, there is a scarcity of Old Age Facilities, therefore, to get patients of Alzheimer's disease, the researcher opted for Age Care Facilities because the patients are gathered there and this sampling allowed the researcher to gather qualitative responses. Unlike getting the sample from a village with no medically proven history of Alzheimer's disease.

Furthermore, judgmental sampling was used to select Alzheimer's disease patients above 65 years. In judgemental sampling, the chosen sample is solely at the discretion of the researcher. Akman (2023) defines judgemental sampling as a non-probability sampling method that selects the sample based on the researcher's best judgement. The researcher had wanted to scrutinise the impact of Alzheimer's disease in relation to the comprehension and production of speech, therefore, choosing patients of Alzheimer's disease was of best interest as it allowed the researcher to draw data relevant with their research questions and objectives.

The Alzheimer's disease patients that were used in this research were above the age of 65, it was 8 females and 1 male, they were all bilinguals and right handed.

Convenience sampling was used to opt for the healthy reserve as well for unbiased data. Saunders (2012) says convenience sampling is a type of non-probability sampling that involves the sample being drawn from that part of the population that is closer to hand. Convenience sampling is a sampling technique that is adopted by researchers when they collect research data from a conveniently available pool of respondents. It is the most commonly used sampling technique, as it is incredibly prompt, uncomplicated and economical.

It was convenient for the healthy reserves because they also reside at the Age Care Facilities so it was easier to have them grouped together. Having chosen the sample, the researcher then used corpora and transcribed verbatim which was adapted from Komjakraphan and Karuncharempanit (2021). The general definition of corpus is 'a collection of written texts, and since questions about language have engaged people since the earliest of times, using corpora to describe language is as ancient as any kind of language research' (Sinclair, 2005).

In the focus groups, the researcher recorded the conversation with the participants, with their permission. The researcher created a relaxed and comfortable environment for the participants first by ice breaks and asking them about their health. While conversing with them, the iPad was the recording tool the researcher used which recorded ongoing conversations. As the researcher conversed with the participants, the assistant focused on non-verbal data on both the healthy reserves and Alzheimer's disease patients.

Non-verbal data relied on the behaviour and actions of the respondents during the discussions. Non-verbal data provides thicker descriptions and interpretations compared to the sole use of verbal data (Fonteyn, Vettese, Lancaster, & Bauer- Wu, 2008). After the meeting in their own comfort zone, the researcher transcribed the verbatim into corpus.

3.6 Data Collection Procedures

The term data means information. Data collected specifically for a specific purpose, is called 'primary data' (Alok, 2017). Data collected and published by one organisation or person and used afterwards by others is called 'secondary data'. By its nature, this research used 'primary data'. Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated

research questions, test hypotheses, and evaluate outcomes. Regardless of the field of study or preference for defining data (qualitative, quantitative, mixed) accurate data collection is essential for maintaining the integrity of research.

Focus groups were used as means of data collection. Conservation social science has come of age (Bennett et al., 2017). From being an outlier and on the side-lines of the discourse on conservation, the importance of understanding human perspectives is now centre stage in conservation decision making (Bennett et al., 2017; Khadka, Hujula, Wolfslehner, & Vacik, 2013; Paloniemi et al., 2012). Focus groups discussion is a technique where a researcher assembles a group of individuals to discuss a specific topic, aiming to draw from the complex personal experiences, beliefs, perceptions, and attitudes of the participants through a moderated interaction (Cornwall & Jewkes, 1995; Hayward, Simpson, & Wood, 2004; Israel, Schulz, Parker, & Becker, 1998; Kitzinger, 1994, Morgan, 1996).

The methods' popularity is closely linked to the rise of participatory research, especially the "active experimentation with focus groups" in the academic social sciences during the 1980s (Morgan, 2002). The technique emerged as a qualitative data collection approach and a bridging strategy for scientific research and local knowledge (Cornwall & Jewkes, 1995).

Focus group discussion require a team consisting of a skilled facilitator and an assistant (Burrows & Kendall, 1997; Kruegar, 1994). The facilitator is central to the discussion not only by managing existing relationships but also by creating a relaxed and comfortable environment for unfamiliar participants. Similarly, the assistant's role includes observing non-verbal interactions and the impact of the group dynamics.

In using the focus groups as a procedure for data collection, the researcher, alongside her assistant, sat participants (patients and the healthy reserve) in a circle and engaged them in a conversation while recording the conversation, with consent from the participants. To elicit speech, the researcher prompted the participants for several biographical details, such as place of birth and family history. The participants were then given an opportunity to describe these biographical details through conversations with the researcher. The conversations were recorded and were later transcribed.

3.7 Data Analysis Procedures

Focus group discussion usually yields both qualitative and observational data where analyses can de demanding. According to Leech and Onwuegbuzie (2007, 2008), qualitative analysis

techniques that can be used to analyse focus groups data include grounded theory analysis (Charmaz, 2006; Glaser, 1978, 1992; Glaser & Strauss, 1967, Strauss, 1987), content analysis (Morgan, 1988), and discourse analysis (Potter & Wetherell, 1987). Morgan (1988) recommends the use of content and ethnographic analytical technique to analyse data from a focus group discussion since it affords the researcher an opportunity to obtain both qualitative and quantitative information through a 'three element coding framework' leading to mixed content analysis (Morgan, 1988).

This study employed content analysis as a data analysis procedure. Luo (2022) defines content analysis as a research method used to identify patterns in recorded communication. The analysis uses inductive reasoning by which themes and categories emerge from the data as the researcher carefully examines and constantly compares emerging issues (Klaus, 2004). This analysis mainly focuses on those applications that are based on transcripts, newspapers, speech, and films. In other words, it mainly focuses on communication-related applications.

The first step which is the initial coding, in content analysis, involves the generation of numerous category codes without limit (Charmaz, 2006). At this stage, the researcher listed corpora and identified key words used by the respondents frequently as indicators of important themes. The second stage involves the focus coding, where the researcher categorized the corpora in the first stage into themes of linguistic distinctive features. This process of data coding has yielded quantitative results to draw comparisons between the normal aging adults and patients with Alzheimer's disease.

Content analysis enabled a systematic coding of data by organising the information into categories hence came the discovery of patterns undetectable by merely listening to the recordings or reading the transcripts. The researcher carefully listened to the recordings and transcribed them. From the transcribed verbatim resulted the words and phrases which were analysed through themes and the quantifying occurrence of such themes was analysed quantitatively. Once all the data was analysed, the researcher consolidated the results into a coherent report.

3.8 Ethical Considerations

Even though this study is not clinical by nature, it dealt with the lives of vulnerable people in the health sector, therefore, the researcher adapted the Declaration of Helsinki. The health of my patient will be my first consideration.

Preparing to seek ethical approval may seem like a lot of work, but it is essential to remember some of the terrible crimes that have been committed against humanity in the name of research, and to understand that rules governing ethics are there for a good reason. Research ethics govern the standards of conduct in researchers. Resnik (2020) defines this concept as norms for conduct that distinguishes between acceptable and unacceptable behaviour.

The conerstone of ethical research is 'informed consent' (Denzin and Lincoln, 2011). The sample must be fully informed of what is asked of them, how the data will be used, and what (if any) consequences could be there. The sample must provide explicit, active, signed consent to taking part with the research, including understanding tehir rights to access their information and the right to withdraw at any point. If the consent letter is unclear, it will result in a weak consent agreement, which may compromise the quality of data collected due to mistrust (Miles and Huberman, 1994) and not provide good protection for the sample or researcher.

The aspect to 'informed' should include clear explanation on :

- Who the researcher is
- What the intent of the research is
- What data will be gathered from the sample
- What level of commitment is required from the sample
- How will the data be used
- What are the potential risks of taking part in the research

To begin with, consent was granted to the researcher by the university to conduct this study. Thereafter, the researcher wrote a letter to the two Old Age Homes to seek permission which was later granted. The researcher took it upon herself to respect the right to self-determination. Before engaging in conversations with the participants, the researcher verbally asked the participants for consent to have the conversations recorded. The researcher recognised the participants' capabilities, perspectives, and their right to make choices about whether or not they wanted to take part in the research. Upon consent, the researcher allowed the participants to act in an autonomous way. This autonomy was protected by ensuring that any consent to participate in the study was informed. The researcher ought not to inflict harm or evil. The participants were assured that they would not be harmed in any way and that their

identity was to be confidential or anonymous. Since the study was dealing with two different groups of participants, the researcher ought to ensure fair entitlement to resources. The participants were treated equally in every way since not all people are equally competent or equally healthy.

3.9 Summary of the Chapter

The heart of every research is the problem, it is paramount to the success of the research. Kush (2005) defines a problem statement as a concise description of what is to be addressed in a proposed research. The research problem of this study is primarily the communication breakdown between carers and patients of Alzheimer's disease, and this study aimed at finding ways to preserve speech production and comprehension in people with alzheimer's disease. To achieve this, a scientific layout of how research was carried out, had to be deployed.

This study used the mixed method research design being qualitative and quantitative, and convenience sampling was used to choose the two Age Care Facilities, Mazenod Old Age home and Pitseng Old Age Home, with a population of nine participants to carry out the research. The participants formed focus groups and primary data was audio taped from them, which was then transcribed into corpora and analysed through content analysis. Throughout the research, the researcher abided by ethics, and no one was harmed in concluding this research.

CHAPTER 4: DATA ANALYSIS AND FINDINGS

4. 1 Introduction

 This chapter focuses on the analysis and findings from the collected data for this study. Richards and Morse (2007) define data analysis as one of the transformation and interpretation of such data. Good research uses a systematic and rigorous approach that aims to answer questions concerned with the study. This study sought to analyse the verbatim here in response to the questions ; (1) Which phonetic dimensions are affected by Alzheimer's disease?, (2) Do Basotho in Age care Facilities have access to medication or any other intervention for Alzheimer's disease that may help improve their speech production and comprehension? (3) Can speech comprehension be enhanced through exemplars?

De Vos (1998) upholds that data analysis calls for the analyst or researcher to consolidate the data into constituent parts in order to obtain answers to their research question(s) and hypothesis. Unquestionably, data analysis is the most complex phase of research, more especially if the study is of mixed method because there is some discrepancies in the approaches, which are likely to confuse the researcher when it comes to analysis. Nonetheless, the study used mixed methods as its research design, and it is of paramount importance to state the hypotheses as advocated by De Vos (1998). The present study hypothesised that Alzheimer's disease negatively affects production and comprehension of speech, resulting in communication breakdown between patients and carers. This inability to communicate effectively frustrates the caregivers because they are unable to communicate instructions to the patients and cannot understand what the patients say when they speak.

Moreover, medication offered for Alzheimer's disease is not easily attained; therefore, there is need for non-medicinal intervention.

As aforementioned, the study has used a mixed method research design, being qualitative and quantitative. The researcher opted for the mixed methods because through it, she was able to get the detailed information and identify certain themes of speech production and comprehension in both healthy aging adults and patients of Alzheimer's disease. The identified themes were 1.Production, 2. Verbal Fluency, 3. Introduction of one's self, 4. Anamnesis, 5. Comprehension, 6. Working with Alzheimer's disease patients, 7. Prosody, and 8. Mitigation of Communication Skills. In addition, through the quantitative approach, the researcher was able to get the generalised, externally valid insight of the numerical data.

The researcher has adopted the methodology used by Komjakraphan and Karuncharerpanit (2021) where the pair has used transcribed verbatim as means of data collection and then analysed the verbatim through content analysis. Due to the state or form of the research being a mixed methods approach, the researcher has preferred content analysis because as Saberi (2016) explains, content analysis is the most valid when comparing the two forms of research approach as well as the results of such a research. Content analysis also helped form an armchair to validate the effects of Alzheimer's disease in speech production and comprehension.

Content analysis is defined as a research method for the subjective interpretation of the content of the data through the systematic procedure of coding process and classification or identification of themes (Klaus, 2004). The analysis uses the inductive reasoning by which themes and categories emerge from the data as the researcher carefully examines and constantly compares emerging issues. For some novice researchers, it is easy to be overwhelmed by the volume of data and not knowing what to do or how to analyse it, Seers (2011) advices novice researchers not to worry, because themes will emerge from the data.

The idea of themes is somehow an epiphany of how the consolidated data shall be laid out. Generally, themes are reoccurrences of the same concept from the data. Data was presented through the emergence of themes and subthemes, as layout in the next sub-heading.

4.2 Data Presentation

In order to understand the surge of interest in Alzheimer's disease and its impact on speech production and comprehension, it is useful to distinguish what motivated it and what made

research possible. The chief motivation was undoubtedly the paradigm shift blatantly noticeable in the Alzheimer's disease patients and in normal aging adults when communicating. Such shifts have been grouped into themes and subthemes. In alliance with the research questions, research objectives, as well as the hypothesis, the researcher has come up with themes which became apparent in the transcribed verbatim from the sample population in Kanana Mazenod Old Age Home, and Elizabeth Bruyere Old Age Home. The identification of themes and subthemes has enabled the researcher to present and discuss the results productively.

The table below is a presentation of themes and subthemes which the researcher has identified in the verbatim.

Table 1

THEMES	SUBTHEMES
1. Production	- Proper enunciation of phonemes - Proper enunciation of allophones - Inaudibility or gibberish
2. Verbal fluency	- ability to flow when conversing - hesitation - speech segments
3. introduction of one's self	- remembers name - remembers surname' - remembers age
4. Anamnesis	- Recall their own medical history - Recall their children - Family history
5. Comprehension	- Prototypes - lies - coherence
6. working with Alzheimer's patients	- social skills - aggression - defiance
7. prosody	pitch

	● tone
8. mitigation of communication skills	● medicinal intervention
	● approaches or theories

1. Production

Speech is one of the natural forms of communication for human beings. Docio- Fernandez et.al., (2015) define speech production as the process of uttering articulated sounds or words. In the transcribed verbatim most of the participants showed no problem or glitches as far as articulation and enunciation of speech sounds is concerned. To keep everyone in light of the subthemes in production, Barry (2006) defines the phoneme as the smallest class of sounds, a phoneme is a set of allophones. Allophones are the linguistically non-significant variants of each phoneme. Allophones are usually relatively similar sounds which are in mutually exclusive or complementary distribution (Trubetzkoy, 1939). Allophones are labelled as non-significant because they neither change the form nor the meaning of the word.

Three participants showed great difficulty in distinction of phonemes and patterning of such sounds:

    i.   *'U re na tjatjing lee ke labokae?'*
    ii.   *'ke koetje tjela nnake'*
    iii.   *'kere ke u koaletje tjela joale hobane mme tjamaa a nammeee*
    iv.   *'kere kaba koo koaletje tjela hoba joale ua bona ke namme ke tjamaea ke namme'*
    v.   *'ke ile ka satsoa tsase mane'*
    vi.   *'ha bana bane ntse ba satsoa ka mona. Ho nale moo ke ileng ka tsoko-tsokotsa teng! Haatše!'*
    vii.   *'ho tloha hosing ha ke tsoha, ke jele papa le boroho'*

These participants have phonetic or phonological manifestations, they had distorted the sounds, meaning, and they have considered an attempt at the target word that did not cross the phoneme boundary. Their speech was produced with perceptible place, manner, or voice deviation from the correct production. The correct words that the participants were supposed to have produced are as follows:

    a) 'U re na 'tsatsing' lee ke labokae?'
    b) 'ke 'koetse' tjela nnake'

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c) 'kere na ke u 'koalletse' 'tsela' joale hobane mme tjamaa a nammee'

d) 'kere kaba koo koaletje tjela hoba joale ua bona ke namme ke 'tsamaea' ke namme'

e) 'ke ile ka 'hlatsoa' 'tlase' mane'

f) 'ha bana bane ntse ba satsoa ka mona. Ho nale moo ke ileng ka tsoko-tsokotsa teng! 'hache!''

g) 'ho tloha hoseng ha ke tsoha, ke jele papa le 'moroho'

Four participants resorted to mumbling or speaking gibberish whenever there seemed not to be a connection between what they wanted to say and what their articulatory organs were ready to give out. This is presented in the two examples below.

viii. *"Do you know Peka? We went there a while ago with a priest and a Nun who passed on due to diabetes… (Mumbles inaudibly)"*

ix. *"U bua le nkhono Tlalane (Murmurs the surname)"*

When the researcher requested one of the participants to repeat her surname, she did so in an inaudible manner. Similarly, this same participant was asked three times what she had done in the morning, but she did not respond. Suddenly, after a short while, she said the following (speaking gibberish)

x. *"My grandmother here in Lesotho, we stayed in Makhoaneng, Ha Khomatsana. It is my grandmother's sister's house, my father's father… it is, it is still my home because they are siblings. You know (speaks gibberish)"*

From this theme, the researcher deduced that there is a challenge of vowel/consonant substitution. Also, there is an issue of 'confabulation' which Belk (2020) defines as the jumbling of words or phrases which sound like gibberish or word salad to the cognitively intact person.

2. Verbal Fluency

Language difficulties are a major problem for people with Alzheimer's disease. In the early stages of Alzheimer's disease, language impairment involves problems of lexical recovery, loss of verbal fluency, and a breakdown in several other communication aspects (Basel, 2022). As stated by Filippi et al., (2022), verbal fluency is the ability to restrain from incoherence or irrelevant information, shift between tasks and hold information in working memory. From the review of literature it is stipulated that a person with Alzheimer's disease has a problem with memory.

Memory serves as grassroots to the impairment of speech production as one cannot produce what he does not know or remember. In this current study all of the participants lacked verbal fluency and would often hesitate before answering or speaking. In the transcribed verbatim, hesitations are shown by ellipses (…) and such ellipses may be seen throughout the conversations.

From the collected data there are four participants who were not fluent verbally due to not knowing the answer to asked questions. Such evidence is as follows:

When asked what they had for breakfast, there is a long duration with no reply

> i. *"I am … mhk! … how old am I????? I ammmm… twentyyy… twenty something there!"*

When asked how old she was, one of the participants hesitated to give an answer and the researcher had to keep on reiterating the question, only for her to reply:

> ii. *" I don't know ma'am"*
> iii. *"ohh surname.. what could it be… my surname issssss Saint"*

Furthermore, still on verbal fluency, two of the participants could not speak fluently due to confusion:

> iv. *"sorry? … I estimate my age to… to 22… or a little bit above that, I am not sure"*
> v. *" papa and brr… and moroho… I had it for breakfast… (long silence) and break"*

One of the participants, who was given the pseudonym North, showed lack of verbal fluency due to agitation. Miss North showed violent behaviour because she was angry she could not recognise herself in the mirror, the conversation was cut short because she just did not want to speak anymore, but fight.

3. Introduction of one's self

One of the purposes of qualitative research is to construct a possible interpretation of the nature of a certain human experience (Van Manen, 1990). For this study, the sole purpose was to find a way to preserve speech production and comprehension in people with Alzheimer's disease. Amidst the collection of data, the researcher discovered that there is a lot of work to

do in order for the purpose to be fulfilled, for these people have even lost sense of self. Some of the participants did remember their names, surname and age with ease, while it was a hassle for others.

Of all the nine participants, one healthy reserve and two Alzheimer's disease patients were able to introduce themselves, as shown below.

i. *"my name is (audibly says the name), and my surname is (audibly says the surname). I have never been married so I do not have any other name. For my age. I will only give you the year I was born and you count, isn't it I took you to school so you could count? I was born in 1953 on the first of January"*

ii. *"… yes ma'am, what is it? My name? I am Psalm Moji. I was born in 1932. I was born in Tŝupane, Matelile"*

iii. *"I am Kim Akhente. I am 71 years"*

The remaining five participants indeed had a hard time with these introductions, here are their introductions:

iv. *"I ammmmm (hesitates for a long time) Lineo Kapase, I stay here. Mhhk! How old am I? I aaaaaamm … somewhere in the twenties"*

When asked about the lady lying next to her, one of the participants said:

v. *"It's a male, his name???? What is your name again? I am twenty. I am not quite sure, I have forgotten but I am around twenty."*

When asked what her name is, the same respondent responded as follows:

vi. *"I am nkhono Tlalane (murmurs surname)"* she is asked to repeat because the researcher could not hear what she said. In addition, the responded was asked how old she is, and she responded thus:

vii. *"(Inaudibly says the surname)"* and then adds *"I do not know ma'am"*

When the researcher noticed that one of the participant was looking at herself in the mirror, she asked her whether she can recognise herself in the mirror. In response, the participant said the following:

viii. *"You are talking to North, who is the lady in the mirror? They look like my neighbour from Mafeteng but I have forgotten them … I do not know her"* the researcher went further to ask her how old she is and she responded saying that:

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ix. *"I don't have dementia"*

"My name is Saint …surname? Ohh surname… what could it be …. My surname isssssssssss Saint. My age? … I estimate it to 22, or a little above that, I am not sure"

4. Anamnesis

According to the Oxford Dictionary, anamnesis is a noun referring to the medical, psychiatric, or dental history before the onset of the condition being investigated. An anamnesis is based on the patient's personal account. It is common for people with dementia as several other studies have shown that people with neurodegenerative disorders lose sense of themselves, they hardly recall their own medical history, cannot remember own children and family history. In this research, most of the participants seem to remember their family history. When asked about their family history, one of the participant had the following to say:

i. *" I have so many children, they are all boys, you won't finish counting them because some are dead, those I have given birth to are Thabiso, Malefetsane, Moeketsi, Teboho, Seabata, Tŝeliso"*

" I was born in 1953 on the first of January"

However, with the demented participants, one participant mistaken the researcher for her daughter, "Mpho". Whilst another seems to recall correctly her medical history, others were just in denial as shown below:

ii. *" that is why I am telling you that I think it is there. I may have it, even though it has not fully revealed itself. The problem I have is in the chest, I have asthma. I am currently undergoing treatment here in morija"*

iii. *"… I do not have dementia, talk to my neighbour who has it"*

This theme however is somehow linked to the following 'working with Alzheimer's disease patients' because most was revealed by the carer.

5. Working with Alzheimer's disease patients

This theme was prompted by one study reviewed in the literature by Thai participants, the study looked at the lived experiences of people taking care of Alzheimer's disease patients. In

their study, Komjakraphan and Karuncharerpanit (2021) found that compliance of caregivers in case of communication was perceived as agreeing with any made up stories or explanations from the elders. All communication strategies and techniques of showing respect, compliance, distraction, and therapeutic lies were considered as effective ways for solving communication problems between the caregivers and the elders with Alzheimer's disease.

In this current study, the carers noted that the patients have problems with listening and taking instructions well, as seen below:

i. " *it is very difficult because they somehow hold grudges and when something is not well with them, they do not immediately voice it out. You will find that when they have forgotten what you have sent them, say you have asked her to bring 10l container in the other room, she'll just go by the corner and she has completely forgotten what I had sent her. When she gets back, she asks you something totally astray, which you have not even asked, or just about anything that comes to mind, she might even say you are her albino child, or anything.* "

ii. " *however, so far, there really is not much bothering me. We have just stopped one going outside the gate saying she is going to buy cigarette, not even knowing where to get it*"

In relation to the second research question, 'Do Basotho in age care facilities have access to medication for Alzheimer's disease that may help their speech production and comprehension?', two carers from the two age care facilities were asked this question to which they replied:

iii. " *as we are sister's we go to training and hold workshops on how to care for these people, we bath them clothe them and medicate them, the medication is sometimes in form of injections and its medication for illnesses like high blood and diabetes* "

iv. " *no ma'am! We d not have access to such medication even if it exists, we use the normal old age medication and it has been months since they had their medication for the normal illnesses*"

6. Comprehension

Speech comprehension is basically the ability to understand or comprehend what is being said. The notion of speech comprehension has been defined thoroughly in the first chapter. In

this research, the participants showed total misconception in comprehension through use of prototypes, lies, and incoherence.

Prototypes

v.   *" they gave me bread and tea, right now I am craving for this slim thing. It has feathers, it ate our vegetables when we planted over there. Yes! A big bird."*

Lies

vi.   *" mhk… I am… how old am I ? I Am twentyyyy… twenty something there"*

vii.   *" it's a male, what is your name brother? (to the woman whom she refers to as a man) who are you again? "*

One of them lied and said she had papa in the morning when the carer asked what she had in te morning

viii.   *" I don't have dementia"*

ix.   *"you asked me the same question yesterday, I told you. "*

Incoherence

x.   *" do you know Peka? We went there a while ago with a priest and a Nun who passed on due to diabetes"*

xi.   *" I have never really liked sugar even in my youth because it leads to rotten teeth. Do you see how beautiful they are? I brush using salty water and a toothbrush… I have long had this brush but it disappears repeatedly and then reappears"*

xii.   *" I do not know who you are"*

As stated earlier, this research has adapted to mixed method. In order to analyse the data statistically, the researcher grouped to themes so they fit the two main themes of the topic 1. Speech production and 2. Speech comprehension. In relation to production, the researcher has grouped the theme (production, prosody and pitch, and fluency) whereas for comprehension they have grouped (introduction to one's self, anamnesis and comprehension). In speech production as an umbrella theme we have three participants who had great difficulty in phonemes and sound patterning, that is 33% when divided by the total participants and four of nine spoke gibberish (44%) and there was a 100% occurrence of hesitation and inability to be fluent verbally.

Moreover, in comprehension, five of nine participants were unable to introduce themselves (55%) , three could not remember much of their past, plus one who was in denial; that is four in anamnesis (44%) and there was a 100% occurrence of not comprehending the researcher.

2.3 Findings

From the data presented above through themes, it has been discovered that in relation to speech production, the elders are unable to properly enunciate phonemes and allophones, further; they are often inaudible and speak a lot of gibberish. From the presented data, speech production has been affected by forgetfulness, not understanding the question, confusion, lack of concentration, as well as disinterest in the conversation. This answers the first research question of this study on the issue of phonetic dimensions affected by Alzheimer's disease, and the objective of identifying the affected dimensions has been met.

To answer the second research question 'Do Basotho in Age Care facilities have access to medication or any other intervention for Alzheimer's disease that may help improve their speech production and comprehension?', the data revealed that the elders do not have access to such medication, they struggle to even have access to simple pain killers. In answer to this second research question, the second objective has been met as well.

The findings of this study correlate with that of Sidtis et al (2015) as they both showed that Alzheimer's disease patients have difficulties in producing discourse. They presented decline in informativeness and coherence.

2.4 Summary of the Chapter

As De Vos (1998) stated that data analysis calls for the researcher to consolidate the data and obtain answers to their research questions and hypothesis. The first research question has been answered, and so has the second. Communication with older adults with Alzheimer's disease was very challenging because of their cognitive impairment. The purpose of the present study was to try and find a way to preserve speech production and comprehension in people with Alzheimer's disease so they may be able to communicate effectively. Nonetheless, the purpose was not achieved because there was a huge gap to be addressed in the problem before devising the solution, the only thing the study was able to meet was to scrutinise and root out the problem.

Since Alzheimer's disease affects the brain, older adults appear to use simpler, less flexible, and more direct encoding system (Banovic, et al., 2018). In addition, they become frustrated when they cannot understand what is being said to them or cannot find the proper word for what they want to say, or articulate their feelings. It makes sense that they resort to defiance, aggressive communication. Confusion, hesitation, or verbal repetition , and relentlessness may be the only behaviours they can use when feeling overwhelmed and out of control. This is as a response to the frustration and stress associated with the inability to communicate effectively.

The qualitative data reveals that there is an effect in communication between carers and patients. The evident of this can be seen from the patients' violent behaviour and aggressiveness, and would go against all heights to get what they want. One of the participants even attempted to smash the iPad that was used to record the conversation, even though they consented to being recorded. As highlighted earlier, the study hypothesised that Alzheimer's disease has a negative impact in the relation of carers and patients, such that there is a communication breakdown and the two parties cannot communicate. The inability to communicate strains relationships and the quantitative data reveals that all the participants lacked relevance, did not fully comprehend the interlocutor, or themselves, thus failure to connect utterances.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter is intended to help the reader understand why this research is important. This paper has a lot of pivotal facets, each calling for knowledge gathering, understanding the subjects and/or nomenclature. In this chapter, however, the focal point is restating the main argument and linking it with the findings. As Holewa (2004) states, the conclusion is the hardest part of a research paper as the writer has already exhausted his intellectual resources. It is, nonetheless, what readers often remember the most, and, therefore must be the best part.

The conclusion is the part of the research paper that brings everything together into a logical manner (Baron, 2008). As the last part of a research paper, a conclusion provides a clear interpretation of the results in a way that stresses the significance of the study. This chapter

provides a clear and concise picture of how the researcher was able to solve the problem or accomplish an answer to the research questions as well as the ability to bridge the gap aimed at. While the introduction sets the expectations, and the body of the research presents the methodology and detailed analyses, this is where the researcher shall demonstrate the significance of the findings, insights and objectives.

5.2 Conclusions

In this section, the researcher provides the summary of the four chapters of this study linking each concept to the findings. The first chapter of this study set afloat by giving the reader background information on Alzheimer's disease, the information was rather clinical than linguistic because there has not been much linguistic or psycholinguistic, per se, research done on the subject. Primarily, Alzheimer's disease is a progressive neurodegenerative disorder beginning with mild memory loss and eventually to the loss of the ability to carry on a conversation. What prompted this research is that in Lesotho, there is assumably a number of children, orphaned children to be precise, raised by their grandparents, and such grandparents are 'reserve banks' for the culture of their families. For these Alzheimer's disease patients to pass on the culture unto their grandchildren, there is a need to recall and communicate effectively with the children, but unfortunately, Alzheimer's disease hinders effective communication.

The first objective of the study was to identify phonetic dimensions affected in the production of speech through identification of distinctive features, the findings have shown that three of nine participants had a difficulty in phonetic or phonological enunciation. To give the reader an insight on distinctive features, the central idea on the notion of distinctive feature theory is that the contrast between phonemes can be exquisitely and insightfully described in terms of properties of segments rather than by treating segments as alphabetic atoms (Hall & Meilke, 2022). The speech sounds of the participants which showed a distorted sound, were analysed in term of their phonetic features.

In relation to the findings and the first objective, the conclusion is that the patients seem to have a difficulty with differentiating the consonant sounds. In English, there is no sounds as 'ts' there is one however in Sesotho, the sound encompasses the stop sound 't' and the alveolar non-nasal 's', in the findings this sound has been misplaced with 'tj' which also does not exist in the English Phonetic Alphabet. Moreover, there is yet another consonant blend

which is non-existent in the English Language 'hl', pronounced with the tip of the tongue on the alveolar ridge, this consonant blend has been inadvertently used interchangeably with aforementioned alveolar non-nasal 's'. Also, the bilabial, nasalised, voiced stop sound 'm' was also used in place of a voiced, bilabial, non-nasal, stop stound 'b'.

The second objective of the study was in pursuit to exploring whether Basotho in Age Care Facilities have any interventions as explanatory treatment for poor speech production and comprehension in Alzheimer's disease for the betterment of patient-carer relationship. For this objective to be met, the researcher had to ask the carers at the Age Care Facilities whether there was any medication or approaches to mitigate the disease, the answer was there is none.

With the third objective- To identify the role of exemplars in speech comprehension, the researcher did not have time to introduce the exemplars to the patients and practice comprehending better with the exemplars, however, it is stated in the findings that the comprehension of patients is poor. The researcher herein concludes that the mental lexicon of the patients as well as the healthy reserves is limited, hence the inability to retrieve sounds, words, or information when required or necessary. There is lack of creativity and habitual aspect of language (not replying to a greeting because they apparently do not greet each other at the Age Care Facility).

Still on the first chapter. Out of perceived knowledge deficit in this subject of Alzheimer's disease and speech comprehension and production, the study was guided by three questions (1) Which phonetic dimensions are affected by Alzheimer's disease? (2) Do Basotho in Age Care Facilities have access to medication or any other intervention for Alzheimer's disease that may help improve their speech production and comprehension?, and (3) Can speech comprehension be enhanced through exemplars? As a tentative answer to these questions, the hypothesis stated that Alzheimer's disease negatively affects production and comprehension of speech, resulting in communication breakdown between patients and carers and that strains the caregivers as they are unable to communicate instructions to the patients and they cannot understand what they want to say when they speak. The medication offered for Alzheimer's disease is not easily attained; therefore, there is need for a non-medicinal intervention.

Based on the findings, it is safe to conclude that the study hypothesis was fully supported for the reason that indeed there is a communication breakdown between the carers and the patients of Alzheimer's disease. Also the non-medicinal intervention is of paramount

importance because as is, the elders from Age Care Facilities are not being given their medication, one of the carers stated. The carers and patients are unable to communicate effectively because the patients cannot comprehend what is being said and cannot reply because their mental lexicon has not registered the morpheme they want to produce. This needs to be worked on and certain approaches must be devised because there is no way people can live together and not communicate, more especially if one is a patient and the other a carer. The second research question sought to inquire about medical interventions that can help mitigate speech comprehension and production in people with Alzheimer's disease. Unfortunately, as per the findings, the rights of Basotho from Age Care Facilities are not being met. The elders from Mazenod Old Age home are not being offered any form of drugs whatsoever, even for their high blood or to level their sugar, while those from Pitseng are offered proper care medical wise, just not one for Alzheimer's disease or dementia.

Moving on, the focal point of this research, the aim of the study, was to explore production and comprehension of speech in people with Alzheimer's disease. The purpose was to assist the older generation affected with Alzheimer's disease to be able to produce and comprehend speech using the exemplar theory because the researcher believes that fossilised speech can be retained by constant repetition. In as much as the last objective, the aim, as well as the purpose, had been misconstrued by the findings, the significance of the study still stands and has not been deformed by the findings. The significance stated that this study shall have a positive impact on the helpers or carers of people with Alzheimer's disease in that it will introduce them to what is called the cognitive reserve. The concept of cognitive reserve provides an explanation for differences between individuals in susceptibility to age-related brain changes or pathology related to Alzheimer's disease, whereby some people can tolerate more changes than others and maintain function (Stern, 2012). Greater understanding of the cognitive concept could lead to interventions to slow cognitive ageing or reduce risk of dementia. From a medical or pharmaceutical or clinical perspective, Basotho may benefit from this study in that it has recommended different drugs that the United States uses as means of regulating Alzheimer's disease.

The next chapter of this study was the review of literature, where the researcher adopted the methodology used by Komjakraphan and Karuncharerpanit (2021). The pair used transcribed verbatim as means of data collection and then analysed the verbatim through content analysis. Some of the literature, Banovic (2018) to be precise, corroborated with the findings in that during the beginning phase of Alzheimer's disease, the patients may not be able to find

specific and familiar words to describe or explain something. This led to the conclusion that indeed Alzheimer's disease patients resort to the use of prototypes when they are unable to express their ideas to others.

To achieve these eye-opening results and the supported hypothesis, in the methodology, the researcher adapted mixed methods to gain an in-depth knowledge of how deep language production and comprehension is affected and how many were the occurrences of production and/or comprehension shortcomings. The population of the study were two groups, healthy reserves and Alzheimer's disease patients. The researcher chose two Age Care Facilities which are geographically apart to make sure that the sample was representative of the whole population. Corpora was audio taped and collected from the sample, thereafter, analysed though content analysis. The researcher abided by ethics, and no one was harmed in conducting this research.

In the fourth chapter, the researcher consolidated and analysed the data collected from the Age Care facilities. In conclusion, the first research question has been answered, and so has the second. The hypothesis has been supported as well.

5.3 Recommendations

The present study represents the first attempt to look at speech production and comprehension in people with Alzheimer's disease in Lesotho, the conclusion based on findings is but a plea to researchers in psycholinguistics to venture more into this and help our elders. It has been concluded that the elders cannot differentiate the consonant sounds. Therefore, it would be helpful to keep them engaged in a conversation or reading practices so they may familiarise themselves with the sounds. The major recommendation, however, is the plea to the government to take care of the elders who are in Age Care Facilities and abide by their policy set by the Ministry of Social Development. The ministry shall provide medication for the elders, the likes of cholinesterase, which is good for memory and thinking.

The shortcomings of this study is that it used one healthy reserve and compared them to the eight Alzheimer's disease patients. It is recommended that future researchers use an even number between the healthy reserves and patients.

Future researchers are encouraged to look at how the problem of Alzheimer's disease can be dealt with.

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Appendices

Elizabeth Bruyere Old Age Home (Pitseng, Leribe) transcribed verbatim.

To keep the identity of the participants confidential or anonymous, the researcher has opted to giving the participants fictitious names or pseudonyms so that it becomes impossible to see whom the information relates to. According to Cambridge Dictionary, a pseudonym is a number or a name with no meaning that is used instead of information relating to a particular person.

This appendix comprises of transcribed verbatim between the researcher, carer at the Elizabeth Bruyere Old Age Home, and the elders from the Age Care Facility. There is a research assistant present but they do not engage in conversations.

Carer: Bo ausi! Le na le baeti, ba batla ho buoa le lona! Ua utloa Mampolo? Nkhono?

NKhono: (aggressively) Ha ke bui le batho! Batho ha ke bui le bona. Ha ho motho eo ke buoang le eena.

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Research Assistant: Lumelang

Researcher: Lumelang! Ka lebitso ke Bolofo Naledi, ke tlile koano hot la qoqa le lona ke utloe na …

THE RESEARCHER WAS RUDELY INTERRUPTED BY ONE ELDERLY WOMAN WITH SEVERE ALZHEIMER'S DISEASE

Nkhono: ha ke bui le batho ausi! Se ke be ua mpuisa. Ha ke bui le batho se keba mpuisa. Se ke ba ua ba ua mpuisa! Ha ke bui le batho. 'Na ha ke bui le batho.

Researcher: Ke kopa u ntšoarele Nkhono, ke motho ea ntseng a hlahoba batho ba baholo kappa ba seng bale baholo ke ba thusa ka puo. Joale, ke ne ke kopa ho qoqa le lona nako e khutšoane, le ha e kaba metsotso e mehlano ho isa boshomeng.

Researcher: Ke kopa ho botsa na 'm'e ke 'm'e mang?

Lineo: ke … (hesitates but eventually mentions name and surname)

Researcher: ke kopa ho botsa na hae ke hokae?

Lineo: hona mona

Researcher: okay,'m'e! U lilemo li kae?

Lineo: (Hesitates) mhhhk… likae? Liiii…twentyyyy… twenty-mang mang mono!

Researcher: Okay 'm'e! hojoamg? Ho hantle moo hae? U ntse u lutsi hantle?

Lineo: (deep sigh) heey! Hantle… hampe…

Researcher: ke kopa ho tseba lebitso la 'm'e

Lineo: ke abuti

Researcher: oh! Ke abuti? Abuti mang?

Lineo: Abuti mang? (To the other woman whom she refers to as a man) u mang uena hana? 'na ke twentyyy… ehlile ha ke sa tseba hantle, ke lebetse, empa ke twenty mang mang.

Researcher: Mohlomong Nkhono u ka re qoqela ka letšeare la hau la tsatsing lena, na letsatsi la hua le bile joang ho tloha hoseng? Hore esale u ntse u etsang, ua jang?

Lineo: ke ile ka satsoa tsase mane

Healthy Reserve 1: Na ke tsatsing lee?

Lineo: ha bana bane ntse ba satsoa (hlatsoa) ka mona. Ho nale moo ke ileng ka tsoko-tsokotsa teng! Haatše! (hache) ha ke hopole ho na le ntho eo kee sebelitseng!

Researcher: Le jeleng hoseng?

….

Carer: Mpolo! U lebetse? U jeleng hoseng?

Lineo: ke jele papa

Carer: hona hoseng? Eaba motšeare u jang?

Lineo: kaja papa

Carer: (sarcastic laughter) hape?

Lineo: eya

Carer: ohong!

Researcher: Lumela 'm'e! lekae? Kenna Bolofo Naledi, ke motho a thusang batho ba baholo ka puo 'me ke moeti oa hau nako e khutšoane feela. Ke kopa ho utloa na ke bua le 'm'e mang.

Lerato: eya 'm'e

Researcher: ke kopa ho botsa na ke bua le nkhono mang?

Lerato: ha ke letsebe le bo mang.

Researcher: ke Naledi Bolofo

Lerato: Oya mme!

Researcher: ke bua le Nkhono mang?

Lerato: Nkhono Tlalane (murmurs the surname)

Researcher: mme?

Lerato: (inaudibly says the surname)

Researcher: Nkhono o lilemo likae?

Lerato: u lilemo likae nkhono?

Lerato: ha ke tsebe 'm'e

Researcher: okay mme! Ebe nkhono u ka qoqa hanyane ua njoetsa na u ntso lutsi joang moo? Bophelo ba moo bojoang?

Lerato: mhhhh… (Sigh) kea phela mme

Researcher: u ka re qoqela ka letsatsi la hau la tsatsing lee ho tloha hoseng hofihlela hona joale hore esale u ntse u etsang? Ua jang?...

Lerato: 'm'e?

Researcher: u ka re qoqela ka letsatsi la tsatsing lee?..na …

Lerato: eya 'm'e

Researcher: na hotloha hoseng ho fihlella hona tjee na u la etsang ua jang

Lerato: eya 'm'e

Researcher: rekopa u re qoqele feela na hoseng tsatsing lena unontso etsang ua jang?

Lerato: eya 'm'e

Researcher: eya

…

Researcher: hoseng u la etsang?

Lerato: e?

Researcher: hoseng u la etsang?

Lerato: (speaks gibberish)

Researcher: ha ua etsa letho?

Lerato: eya!

Researcher: esale u lutsi moo?

Lerato: eee

Researcher: ua jang?

Lerato: e?

Researcher: ua jang hotloha hoseng?

Lerato: papa le bb… le moroho

Researcher: hoseng le motšeare?

Lerato: eee… le break

Researcher: hana nkhono o itse haa tsebe o lilemo likae?

Lineo: eya mme

Researcher: ha a hopole na ekaba lilemo likae?

Lineo: eya mme

Researcher: mohlo mong u ka hopola ka lapeng, bana ba teng?

….

Researcher: kappa litloholo?

….

Researcher: ache! Rea leboha nkhono.

Lineo: eya 'm'e!

Assistant: lumelaang

Researcher: lumela 'm'e!

Tanki: lumelang bo 'm'e

Researcher: le phela joang?

Tanki: re teng, lekae?

Both Assistant and Researcher: re teng!

Researcher: nna ke Bolofo Naledi, ke ntse ke tsamaya le 'm'e Nkonini Sebatana

Tanki: ohhh!

Researcher: re tsoa Maseru ntse re thusa batho ba baholo ka puo.

Tanki: ohhhooo

Researcher: moo e ka bang e ea haella

Tanki: e kang ea mofuta o feng ngoaneso?

Researcher: e ka reng ea ha u bat la ho bua ebe ha u sa hopola na uno reng

Tanki: ohh 'na ntse ke khona

Researcher: u ntse u khona ho etsa tsohle?

Tanki: eya

…

Tanki : ba sa khoneng ba teng mona! Ha ba le bontša bona?

Researcher: aa mme re ile ra bua le babang!

Tanki: oho

Researcher: re ntse re pota-pota re bua le batho kaofeela

Tanki: eya! Batho ba mono ke bona ba ka tsebang na bakuli ba bona ba tsamaea joang. 'na ke mafikizolo siyevana? Lea utloa.

Researcher: eya mme!

Tanki: (laughs) ohh le ea e tseba puo ee!!! Ke bona u bosesela, u Xhosa?

Researcher: ae 'm'e!

Tanki: u oo e utlui feela ba e bitsa?

…

Tanki: mandii.. se ke lebetse se kere siyevana

Researcher: siyavana?

Tanki: siyevana

…

Tanki: ha le e tsebe, le Basotho?

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Researcher: ere re re pele, re kopa ho tseba na re ntse re bua le 'm'e mang. Hore e tle ere ha ntse re qoqa, tle re tsebe!

Tanki: juuu… bana baka ba bamgata joaaaang!

Researcher: no, like! Lebitso la hau, la hau!

Tanki: la tsoalo

Researcher: ee! La tsoalo, la hau.

Tanki: ke (audible enunciates the name and surname)

Researcher: eaba ua nyaloa?

Tanki: ae

Researcher: ha u so nyaloe?

Tanki: ke na le bana feela

Researcher: ha ua nyaloa u na le bana

Tanki: ee! Ke nale bana

Researcher: bana ba hau ke bomang?

Tanki: ke bo boy

Researcher: bo boy mabitso a bona?

Tanki: jooweeee… ba bangata joaaaangg!!

Researcher: ba bakae ka palo

Tanki: ha u na baqeta hoba ba bang ba hlokahetse

Researcher: e! refe palo feela re utloe re qoqe na bo boy ke bo mang mabitso a bona ke bo mang

Tanki: ba hlaileng ke ba bona?

Researcher: e!

Tanki: hoba beo ke sa ba rehang mabitso nke se ke ka tseba

Researcher: eya! Ba hlaileng u ba bona, ua ba tšoara.

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Tanki: ke Thabiso

Researcher: Thabiso (inserts surname)?

Tanki: eya!

Researcher: le?

Tanki: Malefetsane

Researcher: Malefetsane (inserts surname)?

Tanki: eya!

Tanki: Moeketsi

Researcher: eya !

Tanki: Teboho

Researcher: eya!

Tanki: Seabata , Tšeliso

Researcher: eya!

Tanki: six eena ke e tšoere ka matsoho, six enngoe ha ke e tsebe na mabitso a a reiloe ke mang. Enele twelve seaters.

Researcher: ha u ka qetella u bile le monyetla oa hob a reea? Six eena engoe?

Tanki: aa! E ne ele miscarriage

Researcher: e ne le miscarriage?

Tanki: mhh

Researcher: ohho! Uena 'm'e ekaba lilemo li se li le kae?

Tanki: ke tla ufa feela uena u tla n countela, akere ke u isitse sekolong hore u tsebe ho counta?

Researcher: eya 'm'e

Tanki: ke hlaile ka 53 ka li one tsa January, ke mma Jerry mmama Jereman

Researcher: ka 1953?

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Tanki: 1953

Researcher: ka li one tsa January?

Tanki: ka li one tsa January

Researcher: mhhm!

Tanki: ee!

Researcher: lapeng ke kae?

Tanki: lapeng moo ke tsoaloang?

Researcher: eya

Tanki: wayitsi ha ke tsebe hantle, mare k'holo ea rona… re e qalile Joburg

Researcher: Joburg

Tanki: eya, ke holisoa ke 'm'e oa 'm'e oaka!

Researcher: ohh! Nkhono

Tanki: nkhono…moo, Lesotho moo, ra lula Makhoaneng, Ha Khomatsana ke ha nkhono oaka ngoana bo, kore ntate oa ntate oaka, kee..e ntse e le heso hobane ua utloa baa hlahlamana.

Researcher: eya nkhono

Tanki: ua tseba (speaks gibberish)

Researcher: aa nkhono, ke hokae?

Tanki: ke ha u tjeka mona feeela ure

Researcher: uhh! Sebaka sena ehlile ha ke setsebe nna

Tanki: uena u tsoa kae?

Researcher: nna ke hlaha Maseru

Tanki: Maseru?

Researcher: eya 'm'e!

Tanki: le hona mono kena le bana Maseru

Researcher: u na le? Ho bona baa ba tšeletseng bo u ile ua bua ka bona?

Tanki: eya! Ba entsoe ke ntate oo oa Maseru.

….

Tanki: eleeng…

Researcher: ha ua nyaloa?

Tanki: eya!

Researcher: empa u laa..

Tanki: ua utloa e ne e le li chommie

…

Tanki: ke ile ka ba le bana Molimo a mpha pelei!

Researcher: le li chommie tsa hau?

Tanki: eya! Joale ke likhomo tsa ntate oaka akere

Researcher: eya! Bakae joale bao boo reng u ile ua batšoara?

Tanki: ke bona bana be kereng ba ile ba hlokahala hoa sala a le mong

Researcher: ohh ho so setse a le mong?

Tanki: mhh!

Researcher: e leng mang?

Tanki: e leng Moeketsi

Researcher: o ntse a le teng?

Tanki: ee!

Researcher: u ka re qoqela ka letsatsi la hau tsatsing lee hore u ile ua etsang? Ua jang…

Tanki: lipotso tseo hleee… as for tsona!!

Researcher: (laughs) empa re batla ho qoqa le uena feela

Tanki: empa bona le eang disturba hoba ha kea tseba hore ke tlo ba le batho beo ke qoqang le bona.

Researcher: jonaaa! Re kopa tšoarelo, ke phoso ea rona hore ebe ha rea qetella re hlalositse

Tanki: eyaaa…na re jeleng?

Researcher: eya! Ua jang. Kea bona u ntse u sebetsa mona! Kea bona u ntso sebetsa

Tanki: ohhho

…

Tanki: heela nthoe! Ka jang hoseng?

Researcher: eya! Esale u etsang?

Tanki: ke jele borotho ka tee.

Researcher: hoseng!!

Tanki: hoseng.

Tanki: le leshele-shele

Researcher: motšeare?

Tanki: ke jele papa ka moroho le russian

Researcher: ohh! Ae! Rea utloa, ere re seke ra u tšoarella nako e telele mosebetsing oa hau. Moo u ntse u etsang?

Tanki: ke ntša majoe ana ke tlo tšela mobu

Researcher: u tlo tšela mobu ebee?

Tanki: ebe kea katela

Researcher: u khutlisetsa hape?

Tanki: mhh

…

Tanki: ha ke batle majoe ao ka mono. Ha ke tsebe na a batlang mohloeng.

Researcher: u ntse u fatana le majoe

Tanki: eya ke ne ntse ke kuta joang bona

Researcher: u kutile joang boo?

Tanki: eya

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Researcher: u bokutile hantle hore!

Tanki: ee! Akere mosebetsi ha u ithuta oona o tla o tseba

Researcher: u tlo o tseba hantle

Tanki: kapa mosebetsi ha u nontso sebetsa khale o ke ke oa u timella.

Researcher: kannete oona kannete

Tanki: hoba jarete e feile eona kannete ha e monate.

Researcher: ha e ntle hohang eona kannete, ha e ntle.

Tanki: eya! Botle bo kantle, le ha u kaba bohlasoa katlung, mara kantle kehona moo batho ba shebang teng.

Researcher: kea lumela

Tanki: le tsoa Maseru nqa efeng?

Researcher: re tsoa Khubetsoana

Tanki: Khubetsoana

Researcher: eya mme

Tanki: ohhh

Researcher: empa ntse re tsamaya tjena re etsa litaba tsena….

Tanki: bobeli ba lona?

Researcher: eya mme

Researcher:…re etsa litaba tsena hobane ke sekolong se seholo sa sechaba sa Lesotho joale ke ntse ke etsa lipatlisiso ke skolong, ntse ke etsa lipatlisiso ka litaba tsena tsa batho ba baholo le bolebali le puo.

Tanki: ooohh! Bolebali ba stress?

Researcher: eya

Tanki: okaaaaay

Tanki: ohhhooo bahaeso ba teng mane Nazareth, ua tseba Nazareth?

Researcher: eya, kea tseba

Tanki: eya bateng hona mono

Researcher: ba ha Mahase?

Tanki: eya

Researcher: ke tseba batho ba ha Mahase Mohale's Hoek

Tanki: eya lebona ba teng mono

Researcher: Bethele, ebile ke Bethele Mohale's Hoek.

Tanki: Bedelia

Researcher: Bedelia?

Tanki: eya! Le Free State koana e nele teng Bedelia.

Researcher: rea leboha 'm'e, re tla u chakela hape ka moso!

Tanki: ohh le na le lekunutu le nna… ke khaitseli ea bashemane ka tsoala bashemane. Ka futsa nkhono 'm'e oa ntate a etsa bashemane, ka bananeng kamona eaba banana ka ho nkhono 'm'e oa 'm'e a holisa nna!

Researcher: rea leboha re tla u chakela hape

Researcher: le ntse le setse hantle empa Sister le batho ba hau?

Sister: hai! Ke nnete hore u tla fumana hore e mong… ua tseba ntho ee ea hore chee joale ba tloha ma habona bat lo lula moo, u tla fumana hore nthoeno e ntse e sa ba tšoara hantle joale ba na le mosito o moholo. Hona tjena ua bona nkhono (points at nkhono) utla fumana ke moroma hore ke kopa a ntlele nkhono kamane, o tla tjeka hona corneng mona o fumane hore o lebetse. Ha a khutla o tlo u botsa ntho engoe e astray kore etlang ka hlohong feela. Horena o tlore u ngoana hae oa lesoefe kore ntho e nngoe le enngoe. Hona tjena re qeta ho thiba emong are o lo reka koae asa tsebe lore o lo e reka kae.

Researcher: is there some formal training you get? Meriana ea dementia eona le na le eona?

Sister: yes! Re ea li workshopong. Taba ea meriana eona ha re na eona kannete, ekare sentse ba loana hakana ha re tlameha ho bafa meriana hobane bongata re bafa meriana eena ea li tsoekere ka ente joale eba ntoa feela. Empa kannete ha rena ea dementia hohang!

Kanana Mazenod Old Age Home (Mazenod, Maseru) transcribed verbatim.

As previously done with appendix 1, this appendix has also adopted the same ethics in relation to anonymity and confidentiality. Therefore, no real names of the participants have been used, but pseudonyms.

This appendix comprises of a conversation between the researcher and the elders at Kanana Mazenod Old Age Home. Prior this conversation, the researcher was given files on each participant and therefore knew few personal details on the elders.

Researcher: lumelang 'm'e

North: eya mme

Researcher: lekae 'm'e?

North: re teng 'm'e, lekae?

Researcher: re teng.

North: oya 'm'e

Researcher: ka lebitso ke Bolofo Naledi 'm'e!

North: ohh!

Researcher: ke tsoa sekolong sa NUL

North: ohh

Researcher: eya 'm'e! ke kopa ho botsa na ke ntse ke bua le mme mang?

North: u bua le 'm'e North

Researcher: ohh 'm'e North, ntse ke bona hore u ichebile ka seiponeng na ua ipona u motle joang?

North: (confused)

Researcher: u khona ho bona motho eo?

North: ofeng? Eo? (points to the mirror) eya!

Researcher: ua motseba?

North: mang?

Researcher: 'm'e eeno a hlaileng seiponeng?

North: aa! Ke mang?

Researcher: ha u motsebe? Sheba hape ka seiponeng

Researcher: ke mang mme eo?

North: (keeps looking into the mirror with confusion and irritation)

Researcher: 'm'e eo a ka seiponeng u qala ho 'mona? Ha se motho eo u motsebang hohang?

North: ekare mohaisane oaka oa khale ha kele Mafeteng empa ke molebetse

Researcher: kekopa u moshebe sa hoqetela feela

North: ha ke motsebe ke mang

Researcher: motho eno a ka seiponeng ke uena Nkhono!

North: ah!

Researcher: ke bua nnete! Ke uena.

…

Researcher: ebe usole lilemo li kae nkhono?

North: ha kena dementia

Researcher: eya Nkhono! Ntse re iqoqela feela ke ntse ke thusa bo Sister ka ho etsa lipatlisiso kahore na re nchafatsa bolulo le bophelo ba batho ba seng ba le baholo joang

…

North suddenly went quiet

Researcher: kea leboha 'm'e kekopa ho lo buisana le bo Nkhono ba bang!

North: uhlo kene ka ho enoa mohaisane oaka.

Researcher: kea leboha 'm'e.

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Researcher: lumelang 'm'e!

Saint: eeya

Researcher: lekae 'm'e?

Saint: ke teng lekae?

Researcher: ke teng. Eh ka lebitso ke Bolofo Naledi …

Saint: mang?

Researcher: Bolofo Naledi

Saint: u tseba ntate Bolofo ana liee 'muso?

Reseacher: chee nkhono! Empa kee ke utloele ka eena…ebe nkhono eena ke mang?

Saint: Saint

Researcher: fane?

Saint: eng?

Researcher: fane ea hau ke mang? U Saint mang?

Saint: ohh fane… ebe kemang…fane eaaakaaa keee Saint

Researcher: hono ke lebitso la hau, fane eona ke mang?

Saint: … pula ene ena haholo, ua bona kamoo ka kitchen? Ra nka li present le lijo hee! (Giggles)

Researcher: fane ea hau ke West

Saint: ha kea utloa?

Researcher: mabitso a hau ke Saint West, eleng hore fane ea hau ke West.

Saint: okay 'm'e

Researcher: ekaba 'm'e u se u le lilemo likae?

Saint: e?

Researcher: lilemo tsa hau likae?

Saint: … ke li hakanyetsa ho bo 22, kapa hofeta hanyane, hake sure

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Researcher: leka ho hoopla hanyane

Saint: aa 'm'e, ehlile li 22.

Researcher: na u na le bana?

Saint: ua tseba Peka? Ra tsamaya mono khaaale ke tsamaya le ntate Moruti le Sister e mong a na hlokahale a tšoeroe ke tsoekere… (Mumbles inaudibly)

Researcher: kee ke utlui hothoe batho ba baholo boholo ba bona ba na le tsoekere, na uena ha e u sokolisi tsoekere?

Saint: ho tloha ke sale monyane atseba ke sa e rate tsoekere hobane e bolisa meno. Ua bona a matle joang? Ke a hlatsoa ka letsoai le borache ba teng…khale hampe ke na le bona empa boa nyamela bo lahlehe

Researcher: nkhono u na le ban aba bararo! Na u ka hopola mabitso a bona?

Saint: mabitso?

Researcher: eya nkhono, mabitso a bana ba hau?

Saint: ha ke utlui eka ke hopola le haele! Mohlomong le le leng kapa a mabeli

Researcher: leka

Saint: empa ha ke sure ke mang a teng

…

Saint: Relebohile, Rethabile le Mpho.

Researcher: ehlile ke oona Nkhono u a nepile

Saint: ke bona kaofeela? Ke nepile? uena u Mpho akere?

Researcher: aa Nkhono! Nna ke Naledi

Saint: kea tseba, uena u Mpho! U ngoanana feela! Atamela

Researcher: ke Naledi nkhono

Saint tries to smash the researcher's iPad with a walking stick upon frustration and confusion of mistaking the researcher with her daughter.

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Researcher: lunela…

Chicago: stulo ke seo

Researcher: kea leboha! Lumela 'm'e, ka lebitso ke Bolofo Naledi.

Chicago: Naledi?

Researcher: eya 'm'e! ke tsoa kamona ka NUL.

Chicago: ohh ka NUL

Researcher: eya! Ke ntse ke thusa batho ba baholo ba ka bang le bothata ba bo puo kappa bolebali.

Chicago: ba nang le bolebali kappa eng?

Researcher: bolebali le bothata ba puo

Chicago: ohhho

Researcher: bo dementia.. ha una dementia?

Chicago: aache! Keee…joaloka motho e mong, ho na le hore ke lebale. Ke tla lebala ntho, hona joale sesepa ne ke sa tsebe moo ke se beileng, ke tlo fumana hore ke se beile pela hitara mona kamane. Kore bolebali ba ntho tse nyanyana nyanyana.

Researcher: okay 'm'e

Chicago: eya 'm'e

Researcher: 'm'e ke 'm'e mang eena?

Chicago: lemo tsaka li 89

Researcher: joowe… se lile ngata

Chicago: ohh Dementia lee?

Researcher: le bo Alzheimer

Chicago: Alzayina keng?

Researcher: Alzheimer ke bothata bona bo ka bokong bo etsang motho a lebale kapa a lahleheloe ke puo

Chicago: kamokhona ke u joetsang kere ke bona eka nthoeno e teng, lehoja e sobe ka matla-matla-matla

Researcher: ohhho

Chicago: bothata bo ke nang le bona ke ba ka sefubeng, ke motho oa asthma. Lejoale ke ntse ke tsamaya treatment ea asthma mona Morija

Researcher: ohho

Chicago: ke ntse ke ea khoeli le khoeli

Researcher: okay

Chicago: eya 'm'e

Researcher: hofeta-feta moo ha u na mathata a mang?

Chicago: achee! U ka babotsa, akere motho ke eena a itsebang bothata ba hae.

Researcher: mhh

Chicago: emong ke a lulang ka mona, ke 'm'e enoa a ntsa ritsa hoba o sitoa ho tsamaea.

Researcher: ke ea leboha 'm'e.

…

Researcher: lumelang 'm'e

(No reply)

Researcher: lumelang 'm'e

(No reply)

Researcher: lumelang 'm'e

(No reply)

Researcher: lumelang 'm'e

Psalm: 'm'e

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Researcher: err.. ke 'na …

Psalm: ke koetje tjela nnake

Researcher: uh ha ke fete 'm'e ke kopa hot lo bua le uena

Psalm: wee 'm'e

Researcher: 'na ke Bolofo Naledi

Psalm: okay

Researcher: ekaba 'm'e ke 'm'e mang?

Psalm: kere ke u koaletje tjela joale hoba 'm'e tjamaa a namme eena

Researcher: aa 'm'e, ha ua nkoalla tsela.

Psalm: ohhh ngoanesho

Researcher: ke kopa hotlo bua le uena

Psalm: kere kaba koo koaletje hoba joale ua bona ke namme ke tjamaea ke namme

Researcher: aa ke kopa ho bua le uena feela

Psalm: ho bua lenna?

Researcher: eya mme

Psalm: ohh ngoanesho

Researcher: 'm'e ke 'm'e mang?

Psalm: (looks surprised)

Researcher: lebitso la hau..

Psalm: ke mang?

Researcher: Psalm Moji

Researcher: ohh… okay mme, u se u le lilemo likae?

Psalm: mme?

Researcher: u so na le lilemo tse kae?

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Psalm: ke hlaile '32

Researcher: okay mme… ekaba mme pele u lula Mazenod u no ntso lula kae?

Psalm: mme? Moo ne ke lula teng

Researcher: eya mme

Psalm: pele- pele?

Researcher: eya mme

Psalm: haeso

Researcher: eya 'm'e!

Psalm: ha eso ke mane haa… ha.. ha ..Tšupane, Matelile.

Researcher: hana Matelile e Mafeteng?

Psalm: (Delighted) ekeee

Reseacher: ohhh

Psalm: ha se moo he ngoanesho...Mafeteng.

Researcher: tsatsing lee ke labokae, Nkhono?

Psalm: tjatjing lee?

Researcher: eya! Ke labokae? Mantaha, Labobeli, Laboraro, Labone, Labohlano, Moqebelo, Sontaha?

…

Psalm: Sunday

Researcher: u jeleng hosing?

Psalm: ba mphile bohobe ka tee hona tjena ke khalletse ntho e mona e tšesane

Researcher: efeng nkhono

Psalm: e masiba tjena e ne jele moroho ha re lemme mane

Researcher: nonyana?

Psalm: eya! Nonyana e kholo

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Researcher: okay, Nkhono ke tla u batlela eona. Ke sa lo bua le babang hee.

Psalm: oooo ngoanesho

Researcher: lumela 'm'e

Kim: eya 'm'e

Researcher: lekae?

Kim: ke teng ngoaneso nka utloa uena

Researcher: ke teng.

Kim: kea leboha 'm'e

Researcher: 'na lebitso laka le Naledi Bolofo

Kim: Naledi …Holomo?

Researcher: Bolofo

Kim: Holomo

Researcher: Bboloffo

Kim: ohh Bolofo

Researcher: eya mme!

Kim: ohh

Researcher: ekaba 'm'e eena ke 'm'e mang?

Kim: 'na ke Kim Akhente

Researcher: ohho, uena u lilemo likae?

Kim: ntate eloa a sa tsebeng ho bua u so 'mone?

Researcher: ha ke so 'mone

Kim: o teng ntate… ke semumu, ke tsebe tutu, eena hohang. Feela o teng.

Researcher: ohh ke kopane le ntate a apereng gown kae kae

Kim: ekee ke eena

Researcher: ke tla ikopanya le eena

Kim: ha a tsebe ho bua, ha a utlui, kore ke semumu, ke tsebe tutu

Researcher: ohh okay

Kim: completely

Researcher: ke tla ikopanya le eena. Kea leboha.

Kim: tanki 'm'e

Researcher: ekaba 'm'e u lemo likae?

Kim: li 71

Researcher: li 71?

Kim: mhh

Researcher: ohh. Okay! Uena ekare u hantle, na u ntso lutsi hantle lapeng moo?

Kim: ke eo Puleng a li rahela pele le morao. O lahlile molamu. Molamu oaka o kae? Molamu o motle hakaalo oa Sesotho. Molamu oa khale.

Researcher: lumela ntate, lekae?

Scott: re teng lekae?

Researcher: ke teng, kappa ke u tšira letsatsi?

Scott: ee! Le ha u katla ka mona

Researcher: kekopa bo botsa, ntate ke ntate mang?

Scott: le maobane u nontso mpotsa

….

Scott: ke u joetsiste. Kaba kare u kene le mane. Ha nkaba kacho joalo? Kare u kene le monyako oane ha ke ne ke bona u feta ure?

Researcher: ohh kea hopola joale ke kopa tšoarelo.

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                                                           8 May 2023

TO WHOM IT MAY CONCERN

CONSENT LETTER

RESEARCHER: Ms. Bolofo Naledi

At the National University of Lesotho's faculty of humanities, Miss Bolofo Naledi is a fully enrolled and registered student pursuing her Master's degree in English Language and Linguistics. She is currently working on a study about Speech Production and Comprehension: A Case of People with Alzheimer's Disease to fulfil the criteria for this degree. Her target population is the older people who reside in Lesotho Age Care Facilities.

The study will utilise a mixed method approach for an in depth inquiry considering that her study is applied research, and it shall use primary data because much research has not been done on this topic. The researcher decided to use focus groups, and the session shall be recorded, and thereafter transcribed into a corpus for further examination of significant features.

The researcher complied with the Declaration of Helsinki, which guarantees that 'The health of my patient will be my priority'. This letter appeals for your permission to let her access your facility in order to collect data. The primary ethical considerations in the research will be confidentiality and anonymity.

We appreciate you aiding Miss Bolofo in a beneficial way.

Kind Regards

PROF. BEATRICE EKANJUME –ILONGO

SUPERVISOR