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Cortical & Subcortical Dementias:

A Psychoneurolinguistic Perspective

Sadeq Ali Saad Al-Yaari (Corresponding author)

Independent Researcher, Dept. of English, College of Arts, King Saud University (KSU)

Riyadh, Kingdom of Saudi Arabia. E-mail: prof.sadeq@gmail.com

Fayza Saleh Al Hammadi

Associate prof., Dept. of English, College of Arts, King Faisal University, Al-Hassa

Kingdom of Saudi Arabia. E-mail: viceii.library@kfu.edu.sa

Salah Ayied Alyami

Assistant professor, Dept. of English, Dammam College of Technology, Dammam University

Riyadh, Kingdom of Saudi Arabia. E-mail: salah1sa@yahoo.com

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Abstract

Background: A rapidly increasing number of studies that focus on the relationship between language and cortical (CD) and subcortical dementias (SCD) have recently shown that such correlation is existent. Mounting evidence suggests that cognitive impairments should be investigated against language disorders.

Aims: This study aims at investigating how language is associated with dementia diseases namely CD &SCD in light of psychoneurolinguistic approach.

Method: Data from multiple sources (e.g., theses, dissertations, articles, researches, medical records, direct testing, staff reports, and client observations) have been integrated to provide a detailed analysis of the relationship between language and CD & SCD. The researchers identified over 20 most of dementia types, and described them. Having the collected and described data, the researchers then analyzed these data independently to see to what extent

CD & SCD are involved in matters concerning language.

Results: Results of the present study demonstrate that language and CD & SCD are undoubtedly correlated with each other. The loss of the ability of some organs to perform certain functions (due to any of the dementia disease) results in no way to the loss of some language aspects and /or speech skills. In clearer term, it is rare to find a patient with dementia who is not suffering from partial or complete linguistic difficulties. Many deficits run through current interpretation of linguistic disorders: language disorders, speech disorders, articulation disorders, or voice disorders.

Keywords: Cortical Dementia, Subcortical Dementia, diseases, Psychoneurolinguistics, language, impairments, relationship

1. Introduction

The term "*dementia*"is open to a variety of definitions; in its narrowest sense it is "illnesses that affects the brain and memory, and makes you gradually lose the ability to think and behave normally" (Longman, 1995). In view of the information available in the published literature of psychoneurolinguistics on the subject, it can be said that dementia is one of the most serious senility diseases which indicates the loss of intellectual ability. This degenerative syndrome (resulted from deterioration in the brain)may affect the organic and /or chronic areas in the cerebrum. This deterioration causes, according to psychoneurolinguists, direct or indirect loss of language which, in turn, affects the linguistic ability of the person.

Psychoneurolinguistically speaking, there are different types of dementias, each of which affects languagedepending on the host range or deteriorated area(s)in the brain that might have resulted from a stroke, brain damage or brain injuries. It is to be noted here that some doctors and clinician distinguish patients with dementia from those with aphasia in the sense that in the former, there is no brain damage, while in the latter, there is. Put in other way, when dementia patient is tested by any of the modern brain imaging techniques including Computed Tomography (CT), Functional Magnetic Resonance Imaging (FMRI), Positron Emission Tomography (PET), Near Infrared Spectroscopy (NIRS), Electroencephalography (EEG), Magnetoencephalography (MEG) or Magnetic Resonance Imaging (MRI), the results normally show no damage in his/her brain, and that it is no more than a general atrophy. Since the present study discusses the subject from a purely psychoneurolinguistic approach, normal people as well as patients suffering from difficulties in linguistic performance will also be covered.

When investigating dementia and its relationship with language impairments, Psychoneurolinguists differentiate between two broaden types: Cortical Dementia (CD)and Subcortical Dementia(SCD). Unlike the former which is correlated with the grey matter, the latter is related to the white matter. Looking at it from a psychoneurolinguistic point of view, CD is commonly represented by Alzheimer Disease(AD) and Creutzfeldt-Jakob Disease(CJD) as its main forms, whereas Parkinson's Disease (PD), Huntington's Disease(HD), and AIDS Dementia Complex(ADC) (Known sometimes as AIDS/HIV Dementia) are the most common patterns of SCD.

SCD is correlated with nucleus coordination where patients have motor (motor cortex relation) rather than sensory problems. These problems include: gait, personality changes and more importantly language deficits, namely, speech disturbance which is, generally speaking, more subtle and obvious here than in the case of CD. This raises many questions by psychoneurolinguists like: Is language related to recognition(cognitive ability)? How can one distinguishaphasics from dementia patients during the processes of diagnosis? Are there differences between the two patients in matters concerning speech impairments, or language comprehension? Put simply, is it easy for a psychoneurolinguists to distinguish patients with Wernicke's aphasia for example from those of AD?

Generally speaking, if the case is sudden, then it is aphasia, but if it is not (means gradual),

then it is dementia. Furthermore, a patient with dementia may have some other visual (physical)and mental(psychological)problems unlike that of aphasia where problems in most of the times are restricted to his/her mentality. Yet, both patients demonstrate certain symptoms like those related to production of empty speech or meaningless words.

Moreover, in the case of SCD, the problem is due to loss of muscle's center and not language center. This means that the problem is in language motor areas. Put differently, the areas of language representations are not impaired or affected, but a patient is unable to control his or her speech organs to produce language accurately and fluently. On top of that, he/ she may suffer from dysgraphiaand micrographic handwriting due to the loss of control on hand's muscles which means that it is not a linguistic problem; rather, the problem is motor from the beginning to the end.

Other problems may include phonetic, phonological, morphological, and/or lexical problems. More importantly, a patient is unable to learn a new vocabulary item (Benedet et al., 2006), and finally he/she shows problems in sentence progressing. Some neuropsychologists claim that such problems may be accounted for because of something related to memory and attention. In detail, the problem could flow like this: the nourishment of neurons and cells is no more active and renewed or nutrition process does not work anymore. Others claim that some cells and neurons responsible for these functions might be atrophic, but nothing is certain which means that one can guess or infer, but cannot bring final decisions, especially in such issues.

However, in the case of CD, symptoms are different from those found in aphasia like jumping from a topic to another as in the case of Wernicke's aphasia for example. Additionally, Patients can make use of sentence fragments, but cannot make sense yet fluent. They cannot, for example, differentiate between the use and usage of adeictic (Fleche, 2009). A psychoneurolinguist wants to know the reasons behind the failure in grammar: Is it all collapsed or certain features only? In fact, the problem is focused on accessing data, not in representing them. For example, in the CD namely AD, it is just like computer format, where data are no more there. They are deleted, and the patient has literally lost them forever. That is, if a patient with ADis given multiple choice questions, he/she will not be able to select the correct choice, because he/ she cannot "access" the required data which will enable him or her to choose (problems of enabling processing). Hence, language deficits in AD are clearer and more obvious than those found in aphasia.

Literature review

Studies on CD and SCD and their relationships to language have been enriched by many neurologists in general and psychoneurolinguists in particular. Science-research conceptions of dementias types and/ or diseases are derived from research and are greatly supported by experimentation and empirical investigation. Some researchers suggested that the focus should be on the neuropsychological profiles of dementia patients (D'Antona et al., 1985; Brown & Marsden, 1988; Hansen et al., 1990; Crowell, 1992; Richards et al., 1993; Merello et al., 1994; Galasko et al., 1994, 1996; and Salmon et al., 1996).Others focused on dementia patients themselves. According to followers of this opinion, testing the patient is the best

means through which one can diagnose the disease (Gilley, 1990; Massman, 1990; and Jacobs, 1991; Comaty & Edward, 1992).

Neurolinguists started to use language tests to assess dementia patients. More recent examples are referred to as Boston Naming Test (Stevens et al., 1992), and Clinical battery (Walker, 1993; Dunne & Francis, 1993). Some others claimed that better understanding of dementias types require comparing dementia patients (Dammers, 1994; Lineweaver, 1999; Friedman, 1995; Daberkow-Stalp, 1996; Baker, 1996). Psychoneurolinguistic researchers concluded such studies by fully understanding the distinctive features of dementias. On top of that, they realized the nature of the relationship between dementia and language. They made it clear that each dementia type is marked by a language deficit. For example, AD is marked by subtle language deficits linked with aggression. These deficits include word-finding problems, hypo fluency and lexical errors, reading and writing difficulties; LB is marked by Parkinson-like insufficiencies, while PPA is marked by specific and complex language impairments (Welsh et al., 1996; Lee, 1996; Tamaru, 1997; Moran, 1997; Suzanne, 1998).

Attempting to find whether or not there is a clear cut line between Vascular Disease (VaD) and AD, Mast et al., (2002) concluded their study by developing a model known as Multiple Indicators, Multiple Causes (MIMC) which was used later to examine dementia patients. It is clear that it is no longer enough to assess and/ or evaluate merely dementia patients. According to some psychoneurolinguists, the role of SLTs should not be neglected (Bryan& Maxim, 2002).

In 2003, Kapui et al., have discussed the neuropsychological profile associated with variant CJD. According to the team, neuropsychological impairments occur before the onset of psychiatric or neurological symptoms. A similar study was undertaken by Aarsland et al., (2003). The researchers investigated the linguistic performance of dementia patients with PD and LBD. Results outline that cognitive profiles of patients of both types of dementia are similar to those of AD and/or Progressive Supranuclear Palsy (PSP). Such results reflect the superimposition of subcortical impairments upon those types correlated with AD.

Investigating the impact of education on language test performance in both CD and SCD, Schmitt (2004) compared the scores of dementia patients to those of normal ones. Schmitt's results show that the scores of people who show lower education may mislead language impairments' diagnosis correlated with dementia. To obtain more accurate results, some psychoneurolinguists modified some tests. One of those psychoneurolinguists is Dharmaperwira-prins who, in 2004, added some modification to the ABCD test to clearly differentiate dementia patients from those with aphasia.

Schmidt et al., (2005) studied 42 patients with three types of dementia: Alcohol –Related Dementia (ARD), AD, and VaD. One of the results of the team was that ARD patients show an obvious neuropsychological profile when compared with AD patients and those with VaD. This may be accounted for, according to the team, because of the correlation between cortical and subcortical neuropathology. However, understanding this neuropathological relationship between cortical and subcortical areas determines understanding the role played by Speech Language Pathologists/ Therapists (SLP/Ts). It is for this reason perhaps that some

psychoneurolinguists proposed some guidelines and methods to organize the work of SLPs for example. Holders of this suggestion claim that such methods and intervention will facilitate the missions of this group understand the behavioral symptoms of dementia patients (Bayles et al., 2005; Smith &Buckwalter, 2005).

Psychoneurolinguists moved from the theoretical part to the practical one. They started by examining language use in patients from another ethnic background as this may help others in mainstream facilities with dementia and / or those of lower levels of language. According to these psychoneurolinguists, dementias people may benefit from additional language relevant resources (Runci et al., 2005). Such results encouraged some Psychoneurolinguistic researchers and language experts in the field. As a result, they create models like outline-/offline disconnection model to conceptualize Semantic Dementia (SD) for example as a syndrome of disconnection between language functions' networks and those that sub serve memory function. (Passmore et al., 2005). Others recommended the Leukoaraiosis Scale as a good tool of measurement for VaD as it gives precise results for memory/ language impairments (Price et al., 2005).

In recent years, the new trends moved towards understanding the discourse production of patients with dementia. Psychoneurolinguistic studies show a higher occurrence of discourse deficits in advice-giving under the condition of social conversation (Dljkstra et al., 2006). For that matter, some started to investigate word generation in category and letter fluency in AD and VaD (Jones et al., 2006).Some others recommended fluency tasks based on input from data collected (Marc Zinski & Kertesz, 2006).

According to some psychoneurolinguists, one of the conclusions that could be drawn from such studies is that speech and language (Semantic ability and comprehension) deteriorated quicker in patients with CJD than those with other types of dementias (Sowman et al., 2006). Psychoneurolinguists also found that repetition priming and hyper priming are correlated in patients with SD (Cumming et al., 2006). Moreover, SD patients show impairments in quantifiers (Cappelletti et al., 2006). Again, these studies emphasize the role played by SLPs (Irwin, 2006) who are supposed to benefit from their results due to the fact that this group is close to dementia patients more than some other groups.

It would not be wrong to investigate how language impairment is associated with dementias types based on the behavioral symptoms of the patients. However, that is just the tip of the iceberg; the problem begins much sooner, like all human responses, in the brain. To that end, some psychoneurolinguists examined the brain activation by measuring the changes in hemoglobin concentration in brain tissue of people with/ out dementia using NIRS (Richter et al., 2007). Psychoneurolinguists also observed that there is a decrease in speech output, reduction of conversational initiation, and echolalia and changes in the pragmatics of conversation (Mervin et al., 2007). Furthermore, they found that there is a relationship between language impairment in amnesia and AD (Tylor & Olichney, 2007).In addition to the disorders in expressive language and word meaning comprehension, pure word deafness as well as pure anarthriais found to be some other prodromal symptoms of FTD patients (Iizuka et al., 2007).

Such results motivated other psychoneurolinguists who found that Frontotemporal Dementia (FTD) patients are impaired in sentence comprehension, Corticobasal degeneration syndrome (CBDS) (Cotelli et al., 2007). According to Cotellei and his colleagues, FTD patients fail to detect five of the following violations: Semantic coherence (SC), verb-subject agreement (VSAgr), pronominalization involving Clitic movement (CIM), interrogatives (Whs) and contrastive focus constructions (cfc). The situation is different with AD patients who are only impaired in the detection of Whs, SC and sentence comprehension. Surveying the opinions of SLPs, according to some psychoneurolinguists, is important when discussing such results (Hopper et al., 2007).

Strictly speaking, a great attention has to be paid to the effect of tasks used. The same thing applies to the types of stimuli in the patients' performance with action pictures before making theoretical claims about issues related to impairments like semantic representation, nouns, verbs, objects, lexicons, etc. (d'Honincthun & Pillon , 2008). In fact, semantic memory and language processing in both aphasia and dementia are of special importance to the extent that seminars in aspects and language were held to discuss them (Semin Speech Lang, 2008).

Trying to in/validate the above mentioned claims, some psychoneurolinguists compared semantic memory to language processing in both aphasic patients and those with dementia. Results show that aphasic patients may benefit more from semantic treatment than those with dementia (Antonucci & Reilly, 2008; Holland, 2008; Reilly, 2008). In fact, such results cut all doubts that language disorders belong to aphasia per se. It is clear now that language impairments can also be seen in patients with dementia. Paragraphia such as substitution, omission or syntactic errors are observed in patients with ALS (Ichikawa et al., 2008). Using PET, Psychoneurolinguists found that language processing is affected in patients with HD (Teichmann et al., 2008). Some traced the genes to see whether or not they are associated with dementia diseases, notably AD (Lindquist et al., 2008).

In their research entitled: "Predominant Cortical Dysfunction in Guadeloupian Parkinson (Gd-PSP)", applied on 9 patients of Gd-PSP, Apartis et al., (2008) concluded that Gd-PSP patients have cortical myoclonus and cortical oculomotor impairments, and that the dysfunction of the latter sways on the deficits of brainstem. Certainly, what affects the brain is seen on the body. Since AIDS attacks the cells of the brain, notably those of CNS and destroys them, language functions are not exception. Results of McCabe et al., (2008) show that ADC patients suffer from mild language disorders, but are severely impaired in pragmatic language skills. Some psychoneurolinguists also discussed the effects of the semantic impairment on language processing in SD (Reilly & Peelle, 2008).

Others suggested enhancing practical logaoedic concepts on anamnesis, diagnostics and consultation (Steiner, 2008). This proposal was later supported by many psychoneurolinguistic researchers. According to these researchers, understanding the neurolinguistic characteristics of each dementia type may help answer the questions related to these types broadly. How, for example, semantic impairments precede linguistic impairment? Why fluency is less in female than in male with AD? (Bright et al., 2008; Moreno-Martinez et al., 2008) which requires conducting more studies on language structure in dementia (Croot

et al., 2009). Some psychoneurolinguists even recommended relearning small vocabulary as an effective treatment for SD patients for example (Heredia et al., 2009). They claimed that SD patients suffer from open-class content words that are substituted by higher frequency less specific terms (Meteyard & Patterson, 2009). SD patients are also severely impaired on object naming and definition, but are less so on object use (Robinson et al., 2009).

Some examined language in VaD and pointed out that VaD affects multiple cognitive domains including language and communicative functions (Mahendra & Engineer, 2009). Modifying framework derived from Chapman and Ulatowska (1997) to characterize communicative effect, Wang et al., (2009) concluded their study by emphasizing the new modified framework they described as it helps (according to the team) to characterize communicative skills of the individuals, set therapy goals and monitor progress in SD. In bilingual individuals, a regression to a primary language is correlated with development of cognitive deficit (McMurtray et al., 2009). This is perhaps one of the reasons why language in patients with progressive non-fluent aphasia (PNEFA) is more subtle than in those with SD (Rohrer et al., 2009). Based on such results, some psychoneurolinguists invited SLPs to benefit from ethnographic as well as action research when dealing with dementia patients (Müller & Guendouzi, 2009).

Comparing the performance of patients with semantic aphasia in matters concerning pre semantic tasks e.g., reading aloud, past tense generation, spelling to dictation, lexical decision, object decision, color decision and delayed picture copying, results of Jefferies et al., (2010) show that the semantic aphasia patients were less sensitive to typicality than SD patients. This study was supported by Agosta et al., (2010), notably in the part of lexical process.

Some psychoneurolinguistic researchers tested the assumption that bilinguals with dementia regress to use primarily the dominant language. They concluded their study by emphasizing the fact that the greater vulnerability of the dominant language may reflect the incremental probability of AD. This may, according to the team, affect richer semantic representations associated with dominant compared to non-dominant language names (Gollan et al., 2010). Others investigated verbal communication (VC) to non-verbal communication (NVC) in patients with AD, FTD, and LB. The researchers concluded by saying that while patients with AD show more partially impaired, FTD patients show most severe difficulties and LB patients show modest difficulties in these two types of communication (Rousseaux et al., 2010).

Attempting to find a clear cut between PD limits, Bothe et al., (2010) discussed this phenomenon from a neuropsychological point of view. Results of Bothe and his colleagues outline that the probable risks of the disease should be identified in light of comorbid aspects for better assessment. As a matter of fact, language assessment in patients with dementia covered all types of dementias including AIDS (Mupawose & Broom, 2010). For that matter, some psychoneurolinguists suggested imaging techniques for clinicians and caregivers. According to these psychoneurolinguistic researchers, imaging techniques like fMRI provides clinicians and caregivers with more precise prognostic and rehabilitative information about the performance of memory, notably autobiographical one (Maguire et al., 2010).

Some thought that examining bilinguals with mild dementia may help understand language disorders in patients with dementia (Chengappa, 2010). Others preferred concentrating on the types of dementias themselves as this may reveal some mysteries about them. Followers of this trend insist on the fact that understanding communication disorders requires distinguishing the most common types of non-Alzheimer's dementias. These include: FTD, LB, PD in addition to PPA (Reilly et al., 2010). Additionally, they suggested the use of models, software, and therapeutic programs like dual route cascaded (DRC) model of Clotheart, Mosstalk words, and sign language programs (Clotheart et al., 2010; Jokel et al., 2010; Sardina, 2010).

Investigating whether or not there is a relationship between emotional prosody perception and production in AD, the study of Horley et al., (2010) concluded that emotional prosody is impaired in Dementia of Alzheimer Type (DAT). In fact, the prosody of most FTD cases are found to be impaired (Burnell & Hodges, 2010).Using PET to examine alexia and agraphia in both SD and AD patients, results of Suh et al., (2010) show that the former are manifested in these two languages' disorders while the latter are relatively preserved.

Results of comparative studies and those of imaging techniques show that some dementia types are associated with one or two language deficits. These include, for example, naming and disconnection between immune responses, language dysfunction, letter fluency, and generation of fewer words in AD (Moreno-Martinez, 2010; Han et al., 2010; Ringman et al., 2010; Moreno-Martinez & Montoro., 2010), word-finding/ language impairment in aging individuals (Calley et al., 2010), word processing deficit, anomia and garrulous speech with thematic preservation, semantic paraphasia and poor category fluencies in SD (Pulvermüller et al., 2010; Kashibayashi et al., 2010; Kertesz et al., 2010).

Today, studies concentrate on how dementia affects language by comparing the cause and effect. Some psychoneurolinguists started to investigate whether or not there is a specific connection between knowledge of two languages and delay of AD onset. One of the results they concluded that bilingual effects can be obscured by interactions between education and bilingualism (Gollan et al., 2011). Others compared the profiles of language abilities in late-onset depression and mild AD groups. Specifically, the focus of the study was on matters concerning naming, concept definition, imperative verbs, repetition and reading comprehension (Sentence). Novaretti et al., (2011) concluded their study to insist on the fact that language impairments resembling AD is associated with elderly depressed patients. The study recommended using the Arizona Battery for Dementia (ABCD) as a tool for language evaluation in this population.

Psychoneurolinguists are now sure enough that any effect of neurons results on language disorders (Lin et al., 2011). These disorders, however, include word recognition difficulties (two-way anomia) (Kazui & Takeda, 2011) and Proverbs (Lindholm & Wray., 2011). Armed with evidence from imaging techniques' results and symptoms that one can clearly observe in dementia patients, Psychoneurolinguists realized that there is a need to read more about dementia. According to them, one of the best ways is by socializing with dementias people as it has a positive effect (Kaf et al., 2011). They are trying to link language disorders with

visual stimuli by observing the response of facial expressions, body actions, etc. (Mark et al., 2011).

Some used tests to assess language and associated cognition skills in the older population (Bryan et al., 2001).Others thought that it would be better to test the performance of the ears to see to what extent they play a role in listening to language (Bouma et al., 2011). Some went further by examining the cultural and linguistic diverse among sets of nationalities including Australian, Chinese, Spanish, Arabic and Italian. Their aim was to see the way how family carers deal with people with dementia. From among these psychoneurolinguists Boughtwood et al., for example who in 2011 undertook a study entitled: "Experiences and perceptions of culturally and linguistically diverse family carers of people with dementia." The study concluded that while considerable similarities exist across the experiences and perceptions of carers from all the above mentioned societies, there were nevertheless some important distinctions across the different groups.

Some psychoneurolinguists investigated patients with AD, FTD, and PPA to see whether or not their language domains and behavior are associated. Results of Knopman et al.'s (2011) study shows a positive relationship between FTD and PPA, but not with AD. Others compared patients with SD to those with Wernicke's aphasia. The aim of researchers was to investigate three language domains: Language usage comprehension, spontaneous speech and visual semantics. Results demonstrate that whereas both patients with SD and Wernicke's aphasia are impaired on tasks that involve visual semantics, patients with SD are less impaired in spontaneous speech and sentence comprehension (Ogar et al., 2011). Examining lexical effects against word and non-word recalling in both SD and progressive non-fluent aphasia, Reilly et al., (2012) concluded that SD shows greater sensitivity to phonological attributes including phoneme length and word likeness of the target items relative to semantic attributes including the familiarities.

Psychoneurolinguists are now convinced that SLPs need to be taught how to take care of the patients with dementia. They realized that there is a misconception among SLPs about tube feeding in advanced dementia (Vitale et al., 2011). In response to this lack, they developed tests and software to be used by SLP/Ts during therapeutic sessions. These tests and programs include health-related qualities of life instrument (HRQOL) (Lucas-Carrasco et al., 2011), Boston Naming Test (Nebreda et al., 2011), Parkinson Neuropsychometric Demential Assessment (PANDA) (Gasser et al., 2011), Screen for Caregiver Burden (SCB) (Guerra-Silla et al., 2011), etc. Of course, these tests and programs helped diagnose most linguistic disorders of dementia patients like phoneme building (phoneme migration, substitution and omission errors) in SD patients (Jefferies et al., 2012).

SLPs, in turn, suggested guidelines to support caregivers when dealing with clinical populations with dementia as this procedurehelps the patient improve his/her language (Morrow –Odom &Robbins, 2012). Such guidelines, however, encouraged many researchers to investigate the relationship between language and dementia types. Testing the speech in demented and non-demented patients with PD, the study of Ash et al., (2012) concluded that speech fluency is reduced in these patients. According to the team, the speech of PD patients

is characterized by pauses in sentences now and then. Examining grammatical aspects of language, namely sentence processing in patients with PDD and LB, Grossman et al.'s (2012) study deonstrated that there is a selectively slow processing of lengthened ambitious sentences in the two subtypes of dementia. Conclusions to be drawn from such studies need much more investigation. Psychoneurolinguists found that non-native languages are exposed to risk with dementia (Sanders et al., 2012).Language also could be used as a means to overcome the social death of dementia (George, 2010). Finally, errorless methods are found to be applicable to language rehabilitation in SA (Jokel & Anderson, 2012).

1.1 Aims of the Study

So far there are only a very few studies that had been conducted to investigate the relationship between cortical and subcortical types of dementiasand language impairments. The purpose of this study is to examine and elucidate CD and SCD and the diseases linked to them from a Psychoneurolinguistic prospective. More specifically, the study attempts to answer the following questions:

1. Is there a relationship between dementia and language deficit?

2. Based on the typology, symptomatology / etiology and cause and effect, how do types of cortical and subcortical dementias affect language aspects?

1.2 Method

In this study, the researchers collected over 200 studies (theses, dissertations, articles researches, medical records, direct testing, staff reports, and client observations) about the most common types of CD and SCD. The purpose is to investigate the relationship between these dementias types and language deficits. The researchers believe that the more they broaden the study, the richer and more comprehensive it becomes and vice versa. It is for this reason; however, the study covered over 20 main and sub-types of CD and SCD.

1.3 Limitation of the Study

The present study is limited to CD and SCD and their types. The study focused on investigating cortical and sub-cortical dementias not as peripheral issues, but as head subjectsaccording to the significance they occupy in the research, notably in matters concerning language.

2. Analysis

2.1 CD&SCD: Typology

2.1. 1 CD

2.1.1.1 Overview

The term "cortical" refers to brain functions that are thought to be centered in the brain's cortex, or outer mantle. The primary functions considered "cortical" are language and praxis, the ability to perform an action that the brain "knows" how to perform (Fernandez, 2007).

When considering CD, one cannot ignore the fact that the area of cortex in these types of dementias is affected. However, CD patients are often characterized by general weakness or deterioration of memory. Their recall is restricted to the last mentioned words given to them so many times by the speaker to repeat them over and over again. This, undoubtedly, refers to severity in their memory.

Regarding the memory of the patient with CD, it starts to deteriorate temporarily (Moss & Albert 1988; Beatty & Salmon, 1991) and with the passage of time, mainly in the time of senility, this retrogression (marked by forgetfulness) becomes almost permanent (Beatty et al. 1988b; Flicker et al. 1993; Butters& Delis, 1995).However, principal causes of CDsyndrome can be one of the following: AD and Frontotemporal degeneration including: Alcohol and FTD(Perry & Hodges, 2000), Pick's disease, Progressive non-fluent aphasia, SD (Rios-Romenets et al., 2005), etc. Finally, it should be noted that the features of CD are in generalmotor deficits that basically affect personality (Chua and Chiu, 2000), and these symptoms in addition to some others may develop in patients subcortical motor in certain cases (Corey-Bloom, 2000).

2.1.1.2 Types of CD

For one reason or another, it is expected to find people from outside the field using the pejorative sense of the term “dementia”, mingle it with other terms like the term “Alzheimer”, and believe that the two are used for one. Indeed, one cannot deny the fact that there is a relationship between the two terms, namely, the two diseases that are related to each other to the extent that they can easily mislead an untrained researcher in the field.

However, AD/DAT is basically a type of CD. It is considered by most neurologists as the dementia most common cause, and there is now almost a consensus among psychoneurolinguists about an uncontroversial fact that AD is the most common type of CD diseases. Hence, the equation can be formulated as follows: All AD patients have dementia, but not vice versa, as the patients of the former may have some other diseases. In addition to the physical as well as mental symptoms of patients with AD like memory deterioration, delay of alteration and/or response, some language impairments that are clearly seen in the patients of this disease include agnosia, aphasia, apraxia, dyslexia, dysgraphia, and dyscalculia.

Interdisciplinary speaking, the symptoms of dementia vary according to the type of disease, the extent of damage and the degree of severity. For example, hallucination (in terms of unrelated and/ or unorganized sentences and ideas) may not be observed in patients with AD in case we test them visually and/ or mentally. However, these symptoms can be clearly seen in patients with LBD which, in turn, is a combination of CD and SCD; that is why, such classification is complex (McKeith et al., 2003).

A decline of non-literal language including proverb comprehension is observed in patients with AD (Rapp& Wild, 2011). Many language tests have been designed to test the linguistic abilities of the patients with AD. These tests include: Mini-Mental State Examination (MMSE) (Folsteinet al., 1975a), Cambridge cognitive capacity scale (CAMCOG)(Huppert et al., 1995)

and Reminding Test (Small et al., 1995;Reiman et al., 1996). Note here that the last test has been also used to test patients with FTD (Corder et al., 1997).

In the last two decades there has been a growing interest among psychoneurolinguists in understanding all about AD that has attacked 4.5million of Americans and the number is qualified to increase into 40 million by 2050 (Brookmeyer et al., 1998). It causes benignant deficits or what has been known as Mild Cognitive impairment(MCI). Such disorder makes the person unable to recognize spoken or written language including graphics like pictures, tables, maps, etc. (Petersen, 2000), normal aging, neuropathologically proven AD, etc. (Petersen, 2001). As a result, American Academy of Neurology (AAN) published in 2001 a series of scientific evidence and facts based on laboratory analyses and experimental studies. The purpose was that to broaden the literature of dementia from different perspectives and enrich it from various aspects (Knopman et al., 2001; Petersen et al., 2001; Doody et al., 2001).

Creutzfeldt-Jakob dementia (CJD) is another type of CD that may affect people between third decades to seventh decade as a result of a virus called Protenaceous Infectious Particle (Prion). Prion causes threefold symptom: Hallucination, change in personality and weakness in memory. Language deficits caused by Prion include: agnosia, alexia, aphasia, and amnesia. Amazingly, these deficits in particular can also be seen in Patients with AD. The attentionand cognitive processing of CJD patients become slow. Additionally, they do not care about their appearance due to partial damage in the right hemisphere (RH). As a result, the pragmatic linguistic abilities are damaged. Results merely include impairments in appreciating humor, jokes, implied meaning, and language situation appropriateness in addition to strange behavior.

Another frontal lobe dementia is Pick's disease. It is a member of CD family (Katzman 1986; Mendez et al. 1993). Pick's disease (also known as Pick complex) is a generative type of dementia that affects the area within the language areas (Frontal and temporal lobes). This “shrinking” in the front temporal lobes of the cerebrum is accompanied by different types of aphasia including Broca's aphasia, Wernicke's aphasia, and Semantic aphasia. Like AD patient, patient with Pick's disease is also marked by being depressed. That is he/she feels numb and sad most of the time. Depression of this type may lead to the same symptoms of AD which makesthe patients’prospect of recovery almost the same, especially if we know that the two diseases have common characteristics (i.e. degenerative). Both patients with Pick’s disease and AD displace the same multi-atrophic conditions.

Front temporal Dementia (FTD)is a group of diseases that are considered types of cortical dementia. It is also considered an important cause of non-AD dementia. The diseases of this group occur in the frontal area of the cerebrum along with the temporal lobe as a result to focal atrophy which, in turn, might be due to genetic heritage. In details, the disease is transferred from one of the family members (e.g., grandfather/ mother) to his/her children and/ or grandchildren.

Semantic Dementia (SD) is the most common type of FTD. It is a neurocognitive deficit that is characterized by all types of conceptual knowledge, across-the-board deficit affections, and

a steady and continuous loss of semantic knowledge. Language and perception are impaired in SD (Manes et al., 2012).Language aspects that are affected in this type of dementia include prosody, grammar, word and picture naming (Viglieccа et al., 2007; Pakhomov et al., 2010), face-name repetition priming (Calabria et al., 2009), reading comprehension, vocabulary recognition, etc. Since the damage is centered between the temporal lobe and the frontal lobe, both Broca's Area (BA) and Wernicke's area (WA) in the left hemisphere (LH) are also impaired. Put in other way, the production as well as the comprehension of the patient is damaged. One more thing about CD is that the severity of memory is different from other types of FTD family.

Schizophrenic dementia is another type of FTDs which is marked by isolation, loss of memory and other cognitive impairments that explain the reason how and why Schizophrenia is accompanied by dementia. Children's Schizophrenia is different from adult schizophrenia. As the name implies, children's schizophrenia accompanies the child from 4 years old. In this period, the kid becomes timid, quarrelsome, and aggressive. With the passage of time (teenage/ adulthood), the symptoms become more obvious, marked by loneliness, influence with the heroes, disability to distinguish what is real from what is not, illusion, and finally delusion.

Hallucination and loneliness are also some symptoms that one can clearly observe in old people with Schizophrenic dementia. These symptoms plus those of the teenagers' have a cognitive reason. To date, they are due to recognition/cognitive ability. This explains why schizophrenic patients have language impairments including dyslexia, dysgraphia, and dysarthria. It is to be noted here that some neuropsychologists insist on saying that such symptoms can also be observed in some children with autism.

Another dementia type that belongs to the family of cortical and frontosubcortical dementia is called Primary Progressive Aphasia (PPA). This type of dementia resulted from affected parts of the brain, mainly, within the frontal lobe where BA is located. It is for this reason that Psychoneurolinguists believe that PPA is considered the most serious dementia type as it causes disability to language production (non-fluent language) (Kertesz et al., 2003). However, PPA shares this characteristic with semantic aphasics. Unlike Primary Lateral Sclerosis (PLS) where the comprehension of the patients is impaired and the production is spread, in PPA patients, the former is spread and the latter is impaired.

Another cortical and frontosubcortical dementia is Corticobasal Degeneration Complex(CDC) that is by definition a degenerative disease. CDC may lead to extensive severity in both cognition and motor areas in the brain resulting in disability to talk, swallow and move some body parts. The result is an articulation disorder like stuttering. Being hesitant most of the time in addition to the rigidity and the loss of memory, balance and sometimes the ability to walk/ move properly are also some of its symptoms. The patient also cannot see normally which may lead to dyslexia.

Motor neuron disease (MND) is another cortical and frontosubcortical type of dementia. Reasons for this degenerative disease remain unknown. In fact, MND has its own family that includes Amyotrophic LateralSclerosis (ALS)/ Lou Gehrig, PLS and Progressive Muscular

Atrophy (PMA). As the name implies, MND results from atrophic neurons which affect the motor areas in the brain. This atrophy causes a general deterioration in the brain and this deterioration can be clearly seen in other organs that are directly/ indirectly connected to impaired motor areas. These areas include: Speech organs(e.g. Mouth, lips, tongue, throat, velum, uvula, pharynx, larynx, etc.), movement organs (e.g., arms, hands, fingers, legs, etc.) in addition to some other disabilities like muscles' atrophy and swallowing difficulties. Like ALS, the writing and naming (anomia) of MND patients are impaired (Kito et al., 2010; Montagut et al., 2010; Ichikawa et al., 2011; Reilly et al., 2011).

Fahr disease is another genetic (inherited) disease and another member of FTD family. The disease is most often caused by deposited of calcium in the cells and neurons of the brain. The result is a severe damage in the language centers, movement centers and mental centers. As a result, Fahr patients suffer from dysarthria, dysgraphia/ agraphia, apraxia, paraphasia,etc. (Kaiser et al., 2010). Language impairments accompanied both children and adults. The difference is that in children, deficit happens suddenly, while in adults, it does not. Finally, it should be noted that Fahr disease shares some PDcharacteristics.

2.1.2 SCD

2.1.2.1 Overview

It is well believed by most psychoneurolinguistic researchers that it was in 1932 when the term SCD was first introduced by Von Stockert. Neuropsychologists at that time noticed the symptoms of SCD diseases including mental impairments (e.g., slowness of thought), visual/ physical changes, and psychological problems, notably with Progressive Supranuclear Palsy (PSP)patients (Albert et al., 1974). The term was later used in the writing of some neurologists who suggested HD (McHugh &Folstein, 1975). Some neurologists found that symptoms of SCD can be observed in patients with PD, ADC, Corticobasal Degeneration (CBD) (Dubois et al., 1988; Pillon et al., 1994; Pillon et al.1995; Bak et al., 2005; Barnes et al., 2006).

Unlike CD where cortical area is affected, the symptoms of SCD resulted from dysfunctions of some brain areas. Additionally, the mechanism of the disease in SCD is the most important (and difficult)(Cummings, 1993), because through which one can distinguish a disease from another (Robbins et al. 1994). From a psychoneurolinguistic stand point, the diseases of subcortex share commonalities with respect to the pattern of mental changes in each one of them (Cummings, 1990). Symptoms of SCD can be observed not only in the patients with impairments in white matter, but also in healthy people, namely those who are addicted to alcohol.

2.1.2.2 Types of SCD

One of the relatively major types of SCD due to impairment in the white matter is Binswanger's Disease (BD) (Babikian & Roper, 1987; Roman, 1987; Fredriksson et al., 1992; Caplan, 1995). BD is a vascular disease caused by health problems including strokes, especially those related to arteries thickness and other cardiologic problems. The disease might be also caused by brain atrophy. This atrophy takes various forms like blood flow

inadequacy in old people suffering from health problems like high blood pressure that result from heavy smoking, diabetes mellitus in the blood, etc. Social problems are also some other causers of BD. These include all psychological pressure, bad situation, and familial troubles like divorce, betray, and hard life circumstances like poverty, idle, etc. From among the various symptoms may appear on the patients with this type of disease, language deficits can be observed. These include pragmatic disorders due to the fact that RH is severely impaired.

Progressive Supranuclear Palsy (PSP) is another SCD located in the front osubcortical part. It is a degenerative disease that was discovered by the Canadian physician Steele-Richardson-Olszewski in the second half of the 20th century. Psychoneurolinguistic researchers could not find familial reason(s) behind this disease. They believe that there is a genotype which is responsible for the disease. Some are of the view, however, that the disease is caused by tiny cells that fall on important areas in the base of the brain, notably the area within the stem of the brain called "Medulla" due to brain's deterioration. In addition to many physical symptoms including tiredness, gait, loss of balance, etc., language is also deteriorated.

Deterioration of speech is a normal result of the damage in the brain cognition. This, in turn, may lead to some kinds of aphasia where the patient loses the ability to talk accurately, fluently, and/ or his speech becomes unorganized, distorted and confused. In clearer terms, his/ her concentration on his/her speech becomes poor. In fact, his/her speech becomes slurred and incomprehensible. Some of the above mentioned symptoms can also be found in patients with CD namely AD, AIDS/HIV dementiaand those of SCD, notably PD.

Unlike AD which is a degenerative disease, Parkinson's disease (PD)is a motor one. It is thought to be a type of frontosubcortical dementias, but psychoneurolinguists believe that it should better be considered as SCD type because it is involved in brain structures that are deeper than the ones where AD is located. PD is named after English apothecary James Parkinson who first identified it. Despite of the tremendous development in modern imaging techniques, causes of this degeneric disease remain unknown. Some psychoneurolinguists claim that this is due to its viral origin (Hawkes et al., 2009), but nothing is certain.

In PD, Psychoneurolinguistically speaking, both motor and cognitive areas of patients are damaged. Symptoms of PD include insomnia, malfunction of some body's organs, hallucination, general weakness in the brain, namely in the regions where language depends on the abilities of knowledge like memory, abstract thinking, awareness, etc.

Wilson's disease is a degenerative disease that has been discovered by the British neurologist SamuelAlexenderKinnier Wilson in the early of the 20th century. Wilson observed that most of his patients are suffering from such symptoms that can be confused with those of other signs of other diseases especially PD. As to distinguish these symptoms from other signs of other diseases, he reported his observations based on the symptoms he noticed his patients. The British neurologist concluded his research that there is an excessive accumulation of copper on the liver that should be taken away. Wilson's patients suffer from fatigue and find some difficulties in gait, swallowing, moving some of their bodies' parts including mouth, arm, leg ,etc. which may cause them to become swelled and painful with the passage of

time.

Additionally, patientssuffer from some psychological problems like personality and behavior changes through which the patient becomes nervous, anxious, flustered, depressed, clumsy, etc. In other words, the patient suffers greatly from mood disturbances. Some inner and outer physical problems that they may suffer from are nausea and lack if not loss of appetite and skin rash. Clinicians observed that the patient moves his organ(s) involuntarily. Furthermore, ophthalmologists also observed that the iris shifts from skin color into brown. Psychoneurolinguists, in turns, summarized the language impairments that can be seen with Wilson's patients as ataxia (the disability to coordinate) and dystonia (loss of the ability to control the movements of the body organs either partially or completely). As a result, the patient may not sometimes be able to move mouth; therefore, cannot produce accurate language.

The history of Huntington Disease (HD) goes back to the middle age where some physicians noticed that children suffer from losing balance as their parents used to. At that time, the physicians gave the name “Chorea” on the disease. This name continued until the American physician, George Huntington, in the early 20th century exposed its cover. However, HD is caused by a degeneration of neurons in certain sites of the brain. This degeneration results in a deterioration of this area which, in turns, leads to some physical disorders. These include an untold suffering represented by permanent involuntary shaking of some parts of the body and unbalance standing and/or walking with unorganized speech.

This complete loss of body control covers most organs like head organs including eye, nose, mouth, tongue, lips, jaw, moustache, cheek plus other facial expressions like anger, happiness, sadness, tiredness, exhausting, etc. The starting point for this loss of control is no longer the organs of the head, but other organs of body like arms, hands, fingers, legs, etc. are also involved. These symptoms, in addition to many others, can be easily observed in HD. They affect the psychological confidence and linguistic abilities of the patients who become clumsy just like those of Wilson's and unable to produce fluent language or reasonable speech (often marked by dysarthria) (Campbell-Taylor, 1991).

Another subcortical disease resulted from a damage in subcortical white matter is Subcortical Arteriosclerotic Dementia (SAD). For some psychoneurolinguists, the term SAD is replaced by the term Vascular Disease (VaD). However, some neurologists classify VaD as a type of FTDs that are subtypes of CD, but the fact is that this disease is better be added to the subcortical family as the site impaired here is the subcortical area.

VaD attacks old people who might have had a mild brain stroke. Deterioration takes a welter of forms and aspects. These include: Depression most of the time due to impairments in the cognitive performance that vary from a patient to another (Sahakian 1991), and mental affect which causes him lose the ability to communicate with others. Consequently, the patient loses the ability to move some of his/her organs (e.g., mouth and tongue). Moreover, his/her motor is mentally handicapped which means that he/sheis prone to lose the ability to speak. More importantly, his /her language function like letter fluency is affected and he/she suffers from dysarthria or stuttering.

As a result, he/she becomes emotionally isolated from the world around him/her. Problems worsen when he/she starts drinking alcohol, believing that itmay mitigate his pain. He/she may sometimes think and/or behave strangely against others. This continuous deterioration may cause him/her a stroke due to this pessimistic atmosphere; that is why, patients with VaD are likely to die even before those with AD and/ or Binswanger's. It is also for this reason; however, that VaD is considered one of the most depressive dementias.

Like VaD, AIDS/HIV dementia is categorized as a another type of FTDs, but some psychoneurolinguists prefer to consider it a member of SCD family according to the classification of the Family Survival Project(FSP) published in 1991 in San Francisco. AIDS/HIV destroys immunity system of the person. The syndrome affects directly the cells of the brain that are responsible for remembrance and language. When we talk about language here, we mean the motor area that is responsible for moving speech organs which will lead to unorganized speech and difficulties with words comprehension (Wierenga et al., 2011).

Furthermore, AIDS/HIV patient loses the ability to repeat words due to severe damage in almost all areas in his/her Central Nervous System (CNS). Mainly, these areas include WA, BA, and Arcuate fasciculus and Sylvain fissure. As a result, the patient becomes unable to produce, receive or repeat the language because many of his/her language faculties are deteriorated. On top of that, the patient's speech becomes worthless and valueless. In addition, the patient has no feedback due to infection in the middle and internal ear. Put simply, the patients almost lose the ability to hear others as well as themselves which increases the deterioration of the brain due to dead cells resulting from AIDS/HIV.

Repeated Head Trauma (RHT) (boxer’s encephalopathy) or what is nowadays known as Dementia Pugilistica (DP) is one of the most common types of SCD as it relates to the sports which are directly linked with people's life. Originally, the term is derived from the Latin word 'Pugil' which means boxer. In fact, DP is a neurodegenerative disease resulted from a concussion that may happen to a boxer due to frequent beatings on the head. These beatings maycause damage to neurons, axons, dendrites, tissue, protenaceous, corpus callosum, cerebrum, etc.

As a result, the boxer suffers from disability to concentrate (poor concentration) accompanied by unsteady walking. Moreover, his speech becomes unorganized. It is characterized by hesitation, loss of the ability to repeat sentences. Repetition, Psychoneurolinguistically speaking, requires rapid connection between BA and WA which means that any damage to the corpus callosum resulting in the loss of repetition. In fact, the symptoms of this disease are similar to those of PD and AD.

Multiple Sclerosis (MS)is another family member of SCD resulting from disturbances in the cognitive, sensory, motor, visual, physical, mental, and /or even sexual functions. Some of these disturbances affect the speech of the patient and make him/her unable to speak properly and normally. That is, he/she suffers from dysarthria and stuttering due to hesitation. The patient also suffers from being unable to read (developing what is Psychoneurolinguistically known as alexia or dyslexia) as a result of severe damage in the transcortical sensory. WA,

BA, the concept center and transcortical motor areas are also impaired. The result is that the patient loses the ability to articulate, understand and/ or conceptualize words.

Patients may also develop ataxia. In addition to the visual problems that can be clearly seen in the eye, face, mouth, arm and leg, Patients also suffer from mental problems like memory loss, hesitation, slow word recalling, etc. Nor must we forget other neuropsychological disturbances like involuntary urination, incontinence,disability to achieve orgasm, or be sexually motivated.

One more family member of SCD is Metachromatic Leukodystrophies (MLD) that affects both children and adults. The rare late onset leukodystrophies is often related to children beginning from infancy/or first two years and culminating with the age of seven years old. In this period, the child loses the ability to stand, or walk. He/she falls most of the time whenever he tries to run and his/her speech is marked by slowness. Deterioration of the brain is also observed in children suffering from MLD due to atrophy in the cells of the cerebrum. Death normally happens between five to seven years old.

The suffering continues with young children (juvenile) as he/she becomes much more collapsed and frustrated. The speech of the child between four to twelve years old is often slurred. He/ she may develop abnormalities of postural. Intellectual impairments due to atrophic cells and neurons lead to deterioration in the brain. Such symptoms can be obviously seen in the performance of his/her body's parts like gait disability, shaking other organs including facial expressions, etc.

Small-vessel disease is also related to SCD. Sometimes, it is called coronary micro vascular disease or small vessel heart disease as it is related to heart. Strictly speaking, heart consists of two main parts: arteries and vessels. While the former plays the role of pump (by sending blood to the heart), the latter expands to allow oxygen to enter through the heart and then contract when the person is at rest. Therefore, any blemish, deficiency, or shortcoming in the function of any of the above two major parts of the heart causes problems to body in general and to the chest in particular. This chest (angina) expands to include some close organs like neck, shoulders, mouth, jaw, etc. Moreover, it affects breath which becomes short and this, in turns, causes unusual tiredness, loss of energy to move or lift things.

Language is not isolated from all these symptoms because what happens to chest affects the breath which will definitely disturb the process of articulation of speech sounds. In other words, the mechanism of sounds becomes distorted. The results, for sure, vary from losing some sound to dysarthria and incomplete words, yet sentence influence. The speech of the patient with Small-vessel disease becomes slurred, and one cannot distinguish his/her phonetic sounds/phonemes from phonemic ones. Over all, he/she loses the ability to express his/her ideas and thoughts and may suffer from dyslogia, articulation difficulties, and voice and speech disorders.

Lacunar State(LS) is another type of SCD caused by small infracts that is formed in the artery after a small stroke. These infract or holes as some neurologists may sometimes call them have been observed by some physicians in the 19th century. One of those neurologists is the

French Physician Dechamrewho used the term for the first time to indicate a small cavity in the core of infracts (Latin scientists used it to refer to empty holes). However, the term was revived again in the first and second halves of the 20th century by the French physician Marie and the American neurologists Fisher accordingly. These scientists could not neglect Durans-Fardel's definition of the disease who described it as small; deep cerebral infracts (Fisher, 1965a, 1965b; Fisher et al., 1965a; Fisher et al., 1965b; Fisher, 1982, 1991).

Mainly, Lacunar infarcts occur in the subcortical area of the cortex affecting the white matter of the internal capsule directly, leaving traces later on the actual type of dementia. They might be seen in the grey matter, but that is not certain. They also attack the area between BA and WA (Corpus Callosum) which might cause conduction aphasia. Additionally, most parts of the cerebrum might be damaged and this of course may cause partial or complete aphasia (Global). Furthermore, centrum cerebral gyri and semi vale are impaired. Spinal cord could also be damaged. Neurologistsquestioned whether or not the role stem cells in repairing particular areas in the spinal cord remains valuable, especially after stroke happens to old people. Moreover, other areas in the brain might be also impaired. These areas include: Basal ganglia, lenticular nucleus, putamen, and thalamus.

Normal Pressure Hydrocephalus (NPH) is another family member of the SCD. Having observed so many cases, psychoneurolinguists now believe that NPH is most often caused by brain injuries, traumas, strokes, etc. Symptoms that can be obviously seen in patients with NPH include gait, excessive urination, blurred vision, headache, unsteady balance, and difficulty to standing due to pain in the legs. Language impairments are also associated with NPH patients who normally suffer from forgetfulness (due to weakness in their memory) and slowness in speech production and language comprehension. Patients also have problems in multiple choice selections. In other words, if the questions are put in a new or in an unusual method, NPH patient will find it almost impossible to answer them. As a matter of fact, NPH patients reveal a fact that language disorders (receptive and expressive) are correlated with both behavioral and psychological symptoms of dementia. This relationship remains fixed even when the severity of dementia is controlled (Dawn et al., 2003; Spronk et al., 2003; Potkins et al., 2003; Prodan et al., 2009).

However, in addition to the diseases discussed above, Bilateral Thalamic Infraction(BTI) is often correlated with SCD(Castaigne et al., 1981; Cumming & Benson, 1988; de Freitas et al., 2002; Szirmai et al., 2002). Post-surgical hyperparathyroidism accompanied by extensive brain calcification is undoubtedly a SCD type too (Nicolai &Lazzarino 1994). Other diseases like apathy, inhibition, emotional liability, depression, etc. are also considered by some neurologists as family members of SCD (Berman and Weinberger, 1986; Cummings 1990; Buchsbaum & Hazlett, 1997; Rosenstein, 1998; Sachdev et al., 1999; Kim et al., 2000; Rivkin et al., 2000).

Finally, it should be noted that imaging techniques are, generally speaking, valueless in testing dementia types. Some psychoneurolinguists may object to that. According to them, imaging techniques play a pivotal role in diagnosing subcortical areas, notably those of the cerebral cortex (Hamel et al., 1990).

3. Discussion

Multi-infarct dementia (MID) as a subtype of Cognitive Impairment (CI) is split into two broad categories: CD and SCD. It is felt that a distinction ought to be made between these two areas based on which of the brain two main parts is suspected. This includes the cause of dementia, the type and size of the lesion, and the area of the main underlying damage, inaddition to other characteristics that might be observed by the clinicians, etc.

Psychoneurolinguistically speaking, CD refers to the cortical areas and structures affected of which grey matter is the most common, while SCD indicates the white matter in the subcortical structures where it is damaged. Such distinction makes the relationship between the two types similar to between 'dysfunction and disfunction' in deep and white matter structures (Hales et al., 1994). Some Psychoneurolinguists prefer to classify dementia based on the type of syndrome. According to them, CD should include AD/DAT and Pick's disease plus other types, while SCD should include HD, PD, PSP and NPH in addition to other sub-types that are caused by infectious diseases (Sadavoy, 1996).

The classification of dementia into CD and SCD is shaped in substantial ways by how language is impaired. Psychoneurolinguists believe that this classification has its own significance due to the active role played by the two types on the head and peripheral aspects of behavior. However, one of the main differences between CD and SCD is that while in the former, the disease does not continue for all decades of life, in the latter, it does. Yet, there are some symptoms in common among the two areas like those that can be seen in the patients with LBD. Strictly speaking, language is more involved in CD than in SCD. Some Psychoneurolinguists would argue that the involvement of grey matter in languages issue is indirect. They believe that white matter might be involved in matters concerning language, notably language production, but nothing is certain. Certainly, this does not apply to executive dysfunction where it is less in CD, namely, in AD and more in SCD as in PD.

Many forms and patterns of language impairments come into play when a person accounts for CD and SCD — in fact, so many diseases within these two broaden categories. This ramification makes it almost impossible for one to be sure of which language deficit can be found more because of the shared symptoms that are all almost in effect (Thompson, 1987; Azuma, 1997; Taler & Philips, 2008; Agosta et al., 2010). Symptoms are associated with each other which makes it difficult (even much more complicated) to identify which one(s), in particular, truly affect the brain and cause language impairments. Some Psychoneurolinguists claim that SCD as a disease covers no more than 5% of dementias and that the characteristics of SCD are reminiscent of the disease depressive pseudo dementia(Caine, 198 1).

Others may disagree with them, claiming that SCD is a result of a classification derived from clinical observations and noticed by neurolinguists (Cummings & Benson, 1984). Hence, there is almost no unanimity among Psychoneurolinguists on whether the term SCD refers to the psychological changes, neurological changes or both (Steele et al. 1964; Albert et al. 1974).

All in all, when accounting for such issue (differences between CD and SCD), one cannot,

under any circumstances, identify the diseases that are related to each of them. An overlapping area (line) might be drawn between the two areas, yet between the types of dementias that are associated with them. Cortical types of dementias belong one way or another to the cortex and the same thing applies to SCDs. Additionally, the causes of each disease of any of dementia two major types vary according to the sort of the disease itself. Regardless, most of these diseases share the same characteristics of the affected area (that is normally referred to as deteriorations in the brain). Nor must we forget the lesion (which is often a syndrome attacks certain site within cortical and subcortical areas) and the symptoms (where some of them are common in most family members of the same type). Last but not least, the prognosis (wither it is full recovery or rare) is important and it applies to most of the diseases of each type.

Language impairment varies depending upon what type of disease and dementia type. These include language disorders, speech disorders, articulatory disorders, and voice disorders. In a summary of research of these types, more than fifty (50) linguistic impairments were identified. The following two tables summarize these deficits according to the type of dementia. Consider:

Table 1. Language impairments associated with CD.

Disease Name	*Type of language deficit*	*Notes*
Alzheimer Disease/ Dementia of Alzheimer Type (AD/DAT)	Unrelated sentences and ideas. Agnosia. Aphasia. Apraxia. Dyslexia. Dysgraphia. Dyscalculia. Proverb comprehension. Inability to organize spoken or written language including graphics (tables, maps, pictures, etc.)	It shares LBD in some of these language impairments.
Lewy Body Dementia (LBD)	Pragmatic and semantic difficulties like misunderstanding/ misusing aphorism.	It shares this impairment with AD. It is a combination of both CD and SCD.
Creutzfeldt-Jakob Dementia (CJD)	Agnosia. Alexia. Aphasia. Amnesia. Pragmatic linguistic disabilities including logic speech, implied meaning and languagesituation appropriateness.	
Pick's disease	Broca's aphasia. Wernicke's aphasia. Semantic aphasia.	
Semantic Dementia (SD)	Loss of semantic knowledge. Prosody. Grammar. Word naming. Picture naming.	

	Face name repetition Priming. Reading comprehension. Vocabulary recognition. Language production and perception.	
Schizophrenic dementia	Cognition/ Recognition. Dyslexia. Dysgraphia. Dysarthria.	Some of these symptoms can be seen in children with Autism.
Primary Progressive Aphasia (PPA)	Influential language.	PPA patients share this impairment with Broca's aphasics.
Corticobasal Degeneration Complex.(CDC)	Stuttering.	
Motor Neuron Disease (MND)	Speech Disorders (E.g., Blocking, Cluttering- Stuttering, and Dysarthria). Voice Disorders (E.g. Hoarseness and Dysphagia). Agraphia. Anomia.	MND patients share impairments 3 and 4 with those of ALS.
Fahr Disease	Dysarthria. Dysgraphia. Apraxia. Paraphasia.	Patients with Fahr disease share some of these impairments with PD patients.

Table 2. Language impairments associated with SCD

Disease Name	*Type of Language deficit*	*Notes*
Binswanger's Disease (BD)	Pragmatic disorders.	
Progressive Supranuclear Palsy (PSP)	Slurred speech.	PSP patients share this impairment with AD patients, and those with AIDS/HIV dementia. They also share PD patients some of theirlanguage impairments.
Parkinson's disease (PD)	Abstract thinking. Awareness and consciousness.	PD patients suffer from most linguistic impairments of SCD along with those of ADC and/ or those with CBD.
Wilson's Disease	Ataxia. Dystonia. Accuracy.	
Huntington's disease (HD)	Unorganized speech. Sign language	
Vascular Disease (VaD) / Subcortical Arteriosclerotic Dementia (SAD)	Inability to communicate/ speak. Letter fluency. Dysarthria. Stammering.	
AIDS/HIV Dementia	Unorganized Speech. Problems in Word Comprehension.	

	Loss of the ability to repeat sentences, phrases, and clauses. Articulation Problems (e.g., Addition, Distortion, Omission, and Substitution). Meaningless Speech.	
Repeated Head Trauma (RHT)/ Dementia Pugilistica (DP)	Poor Concentration. Random Sentences. Unorganized Speech. Loss of the ability to repeat speech in conversations.	Some of these linguistic deficits are similar to those of PD and AD.
Multiple Sclerosis (MS)	Dysarthria. Stuttering. Dyslexia. Accuracy. Fluency. Language Articulation and Comprehension. Conceptualization. Ataxia. Slow Word Recalling.	
Metachromatic Leukodystrophies (MLD)	Speech Slowness. Slurred Statements.	
Small-Vessel Disease	Loss of some sounds. Incomplete words. Dysarthria. Slurred speech. Phonetic and phonemic sounds problems. Failure of expressing ideas and thoughts. Dyslogia. Articulatory disorders including addition, distortion, omission, and substitution. Speech disorders like blocking, cluttering-stuttering, and dysarthria.	
Primary Lateral Sclerosis (PLS)	Global Aphasia.	
Normal Pressure Hydrocephalus (NPH)	Forgetfulness. Speech slowness. Receptive and expressive language. Multiple choice problems.	

As can be seen in Table 1. and Table 2., linguistic impairments are correlated to dementia diseases. Linguistic deficits are also integrated with each other as well as with dementias types. It should be noted here that some physicians prescribe certain medicines for dementia

patients. They believe that such medicine help these patients by mitigating their pain. Some of these medicines include: Anti-diarrhea, anti-epileptic, anti-histamines, cold and flu medication, lithium, sleeping pills, and tricyclic anti-depressants. However, no specific medication, Psychoneurolinguistically speaking, proved to be useful. Conversely, their side effects include dementia symptoms according to American Food and Drugs Administration (FDA). Psychoneurolinguists recommend languagetherapyand software programs. Language activities should also vary in level of difficulty, so that it would start with some easy and others more demanding. They should also be of interest to dementia patients in general and old dementia patients in particular. In speech language pathology, motivation is more specific than in a dementia-based disease. In light of the above mentioned results, researchers strongly suggest that there should be more studies to broadly discuss the subjects addressed. It is better to use different methodologies to cover more than what have been mentionedin the present study.

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Glossary

AD= Alzheimer Disease.

ADC= AIDS Dementia Complex.

BA=Broca's Area.

BD= Binswanger's Disease.

CDC= Corticobasal Degeneration Complex.

CJD= Creutzfeldt-Jakob Dementia.

FTD= Frontotemporal Dementia.

HD= Huntington's disease.

LBD= Lewy Body Dementia.

MLD= Metachromatic Leukodystrophies.

MND= Motor Neuron Disease.

MS= Multiple Sclerosis.

PD=Parkinson's disease.

PLS= Primary Lateral Sclerosis.

PPA= Primary Progressive Aphasia.

PSP= Progressive Supranuclear Palsy.

RHT= Repeated Head Trauma.

SAD= Subcortical Arteriosclerotic Dementia.

SCD =Subcortical Dementia.

SD= Semantic Dementia.

SLPs= Speech Language Pathologists.

SVD=Subcortical Vascular Disease.

TD= Tardive Dyskinesia.

VaD =Vascular Disease.

WA=Wernicke's Area.

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