EFFECTS OF DYSLEXIA AND DYSGRAPHIA ON THE READING AND WRITING ABILITIES OF UPPER-PRIMARY PUPILS FROM SELECT SCHOOLS IN SABATIA SUB-COUNTY IN KENYA

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN LINGUISTICS

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DECLARATION

This dissertation is my original work and has never been submitted to any other university.

…………………………………..   Date …………………………

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This dissertation has been submitted for examination with my approval as the candidate's supervisor.

……………………………………   Date …………………………

Dr. Alfred Buregeya

DEDICATION

To My Lord Jesus Christ

To my sweetheart, Maureen and son, Urbane

To my dear parents Aineah and Priscilla Afunya

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ABSTRACT

This study sought to investigate the nature and extent of reading impairment (dyslexia) and writing impairment (dysgraphia) in the English of a group of twenty-five upper-primary pupils of the Sabatia Sub-county of Vihiga County who experienced serious reading and writing difficulties. Specifically, it addressed the following questions: one, whether there was correlation between the reading and writing difficulties among the subjects; two, whether the subjects would read and write words better when they were presented in a linguistic context; three, whether functional words would pose a greater challenge than content words in both reading and writing; and, four, whether the subjects would read and write monosyllabic words better than polysyllabic ones. Seven hypotheses related to these questions were tested. To collect data for dyslexia analysis, the subjects were asked to read aloud selected words and sentences in a list, as they were recorded using a voice recorder. For data related to dysgraphia, words and sentences were dictated to the subjects. To test whether there was correlation between the subjects' reading and writing, Pearson's product-moment coefficient of correlation(r) was calculated, while the chi-square(X^2) test was used to test the remaining six hypotheses. The results show that, as the study had hypothesized, there was a high positive correlation between the subjects' reading and writing ($r = 0.79$ at $p<0.01$, with $df = 23$). But the only other hypothesis that was confirmed was that which said that monosyllabic words would be written better than polysyllabic ones ($X^2 = 45.24$ at $p<0.05$, with $df = 1$). Results for two other hypotheses (namely the second, which said that words presented in context would be read better than words presented in isolation, and the sixth, which said that monosyllabic words would be read more easily than polysyllabic ones) pointed in the direction hypothesized by this study, but they were not confirmed because the relevant calculated statistics were not statistically significant. However, contrary to what had been hypothesized, the study found the subjects' performance on both reading and writing functional words was much better than that on reading and writing content words, and also found that words presented in isolation were written better than those presented in context. These results call for further research on the same topic to explore the possibility of there being other explanatory factors at play.

CHAPTER ONE: INTRODUCTION

1.1 Definitions of Key Terms

The key terms to be defined are dyslexia and dysgraphia.

1.1.1 Dyslexia

The word dyslexia is made of two morphemes whose origin is in Greek. Berninger & Wolf (2009: X) explain that, "*Dys* is a prefix that means 'impaired'…[while] *lexia* is a base word that is derived from the word *lexicon* (the mental dictionary of word meanings, and pronunciations) and means 'word.' Thus, students with dyslexia are impaired in the word-level skills such as decoding, word reading, and spelling. Both accuracy and rate may be impaired, or only rate. "

According to the International Dyslexia Association,

> Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge.[1]

Ellis (1984) identifies two types of dyslexia, namely Acquired dyslexia, and Developmental dyslexia. "Acquired dyslexia is caused by an injury to the brain (most commonly caused by a stroke) and it disrupts reading in individuals who were once skilled readers." Developmental dyslexic children "…are intelligent

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[1] Definition retrieved from The International Dyslexia Association website https://dyslexiaida.org/definition-of-dyslexia ***on June 8, 2016***

children with reasonable backgrounds and educational opportunities who are nevertheless unexpectedly poor at reading and writing." Robinovitch, cited in Keeny & Keeny (1968:4), defines Developmental dyslexia as, "Primary reading retardation (one which reflects a definitive neurologic dysfunction in the absence of history or signs of brain injury), as opposed to the Secondary, which is reactive to other pathology or problem."

According to Dyslexia Kenya Organization,

> Dyslexia is a neurologically-based, often familial, disorder which interferes with the acquisition and processing of language. It varies in degree of severity, no two dyslexic people are similar, and it can be very mild, mild or profound. It is manifested by difficulties in receptive and expressive language, including phonological processing, in reading, writing, spelling, handwriting, and sometimes in arithmetic."[2]

As a working definition, the present study will follow the following from Crystal (2010: 283):

> [Dyslexic children are those] who, after a few years at school, are consistently seen to fail at the tasks of reading, writing, and spelling, despite normal intelligence, instruction, and opportunity to learn.

According to this definition, dysgraphia (writing disorders) is subsumed under dyslexia. However, there is need to define dysgraphia independently because some authors deal with it on its own, not as a component of dyslexia.

[2] Definition taken from Dyslexia Organization Kenya website: http://www.dyslexiakenya.org/index.php/what-is-dyslexia on 3rd March 2016.

1.1.2 Dysgraphia

Like dyslexia, the term dysgraphia is of Greek origin. Berninger & Wolf say, "As noted earlier, *dys* is a prefix that means 'impaired.' *Graphia* is a base word that means 'letter form,' 'hand', or 'making letter forms by hand.' students with dysgraphia, therefore, are impaired in letter writing skills."

According to Hendrickx & Salter (2009:107)

> Dysgraphia, also known as disorder of written expression […] is a difficulty in writing which does not reflect the general intelligence and ability of the person. It is rarely seen in isolation and is usually accompanied by other conditions. It is generally thought to be a motor coordination difficulty, but there can be associated difficulties with processing and sequencing, such as letter formation, confusion of letters, particularly 'b' and 'd', for example, and also with other fine motor skills issues, such as tying shoelaces.

Deuel (1995) defines dysgraphia as a specific learning disability in the area of written expression. She identifies three types of dysgraphia as, dyslexic dysgraphia, motor dysgraphia and spatial dysgraphia. She explains that, "[for dyslexic dysgraphia]…the first draft of paper is illegible, but copied work is acceptable. A child with this type of dysgraphia will have difficulty with spelling as well. Dyslexic dysgraphia does not necessarily mean that the child has dyslexia, a reading disability. [Motor dysgraphics have]… a deficit in fine motor skills, poor dexterity and poor muscle tone….Spatial dysgraphia would present itself in illegible written work, even when the work is copied."(pp. S6)

Regarding dysgraphia, this study will adopt the following definition by Field (2004:97-8) as its working definition:

> [Dysgraphia is] Delayed acquisition of writing skills and /or the development of writing which deviates markedly from what is generally

> observed in children. Dysgraphia is often associated with dyslexia, and there are many parallels in the symptoms presented.

Ellis (1984) and Crystal (2010) identify different types of both dyslexia and dysgraphia. Those most important to this study are phonological dyslexia and dysgraphia, surface dyslexia and dysgraphia and, deep dyslexia and dysgraphia.

Ellis (1984:115) says that "…surface dyslexics read predominantly phonically, and frequently arrive at a meaning for a word on the basis of its sound rather than its appearance. Often, the phonemic form of the word from which its sound is generated is achieved by breaking the written form up into single letters or letter groups to which analogies or correspondences are then applied. This strategy results in typically phonic errors; for example, regularizing *bread* to 'breed' and *island* to 'izland', or failing to lengthen the vowel in a word which ends in e, thereby reading *bike* as 'bik' and *describe* as 'describ'"

Crystal (2010: 262) writes:

> [Phonological dyslexics]…are unable to read according to 'phonic' rules that relate to graphemes and phonemes. This means that they can manage to read familiar words, but have great difficulty with new words…or with simple nonsense words. [Deep dyslexics]…are unable to read new or nonsense words… [and make] visual errors (e.g. reading *signal* as 'single')….Words with concrete (as opposed to abstract) meanings are easier to read. [Phonological dysgraphics]…can spell real words but not nonsense words (though they can sometimes read many of them, and speak them aloud). [Deep dysgraphics have] … no ability to spell on phonetic basis; if someone is asked to write a dictated nonsense word , for example, it is often replaced by a real word that is similar in sound. [Surface dysgraphics]… can spell spoken nonsense words… [but] cannot spell irregular real words.

1.2 Background to the Study

As a teacher of English in public primary schools in Kenya, I encountered a number of children with reading and writing difficulties. They could perform relatively well in other activities like singing, drawing and could even speak fluently. A common phenomenon was the clipping of syllables while reading and writing polysyllabic words, for example some would write the words *remember* as *rember,* or write only one part of a compound word, for example either *hand* or *bag* for *handbag.* Some would omit or substitute letters or sounds of the target word, for example, *techer* or *ticha* for *teacher*, or replace it with a completely different word, while others omitted functional words when reading or writing phrases or sentences. Such children were considered lazy and rude, and would often be ignored or unfairly punished by the teachers. These children would finally drop out of school, or perform poorly in their national examinations. The plight of such children has not been adequately addressed within the Kenyan education system, in terms of training of teachers to handle them, and, very little has been done in research on these cases in Kenya. My encounter with these children prompted me to carry out a study to investigate the language issues that affect their reading and writing ability.

A lot of research has been done on language disorders the world over, and a variety of these disorders have been identified in terms of their characteristics and possible causes. Sometimes such disorders are caused by either a stroke or an injury to the brain, affecting especially the left hemisphere to which language is lateralized. Other disorders are developmental, and occur to individuals with no history of injury or stroke. The term specific language impairment (SLI) is often used for such disorders. Radford et al (2009: 213) define SLI as "a term covering disorders *in the normal acquisition of language* without there being any clear primary deficit. Despite their linguistic problems, SLI children and adults have normal non-verbal IQs, no hearing deficits and no obvious emotional or behavioral disturbances." Such disorders include dyslexia (reading disorder), and dysgraphia (writing disorder). Ellis (1984) puts a distinction between acquired dyslexia and dysgraphia (those caused by a brain injury), and developmental dyslexia and dysgraphia (those which can be looked at as a form of SLI). The latter were the focus of this study, since there was no history (or evidence) of brain damage in the case of the subjects studied, hence the study assumed that both the dyslexia and the dysgraphia were developmental.

Some literature suggests that dyslexics have problems with long and multi-syllable words. Johnson (2015: 3) says that "For kids with dyslexia, it can be hard to deal with multi-syllable words. They may have trouble remembering and pronouncing them correctly." While conducting a study on Dyslexic Entrepreneurs, Logan (2009) uses the aspect of difficulty with polysyllabic words as a sign to identify dyslexics. She writes:

> A decision was made after exploring the dyslexia literature and undertaking the initial pilot with dyslexics and non-dyslexics that in order to be classed as dyslexic, respondents must report difficulty with spelling and pronunciation of long words…. Miles (1993) identifies spelling as a key problem for dyslexics and suggests that this continues into adulthood. [He] also found that over 90% of dyslexics struggle with sequencing and 66% of dyslexics have problems reading and pronouncing polysyllabic words.

Berninger and Wolf (2009:129) write that "…reading pseudo words-pronounceable words without meaning- and reading real words on a list are better indicators of a reading disability than reading words in passages in which context clues could mask an individual's true word decoding abilities…. " This implies that when words are presented in a linguistic context, an individual with reading disability is likely to perform better than when presented in isolation. Other writers argue that context will offer advantage to dyslexics only in reading content words, and not functional words.

Shaywitz (2003:112) writes that,

> Since dyslexic readers rely so much on context, it is often difficult to figure out a small, so-called *function* word whose meaning cannot be gleaned from context. For example, a ball could be *on*, *over*, or *under* the table, which makes it difficult to decide which of these choices is the one the author intended. For the same reason a dyslexic might be able to read words such as *tree* and *bat* because they represent concrete objects that can be predicted from the text as well as visualized.

Shaywitz, therefore, implies that even when presented in context, dyslexics should be able to read content words better than functional words. Crystal (2010:283) also writes of a similar difficulty in writing function words identified in the responses of a deep dysgraphic patient to a single-word dictation.

The few studies on reading and writing disorders in Kenya focused on one particular disorder, whether dyslexia or dysgraphia, at a time. Particularly relevant were two recent Master's degree projects Kiongo (2013) and Ondieki (2013). Kiongo (2013) investigated dyslexia among six Class Seven children of the Thogoto Primary School in Kiambu County, while Ondieki (2013) studied dysgraphia affecting two children of the Ensoko Primary School in Nyamira County. Both studies called for the need to explore the relationship (if any) between children's reading and writing difficulties.

Kiongo put it this way:

> Since dyslexia involves dysgraphia(reading and writing skills), it would have been more illuminating if the respondents' reading and writing skills were compared so as to come up with a more clear picture of each one of them than the present study did. (pg. 50)

For her part, Ondieki concluded her study in the following way:

> The study focused on spelling impairment of two children. While the study met its aim, the findings are not generalizable. The study recommends for future, research to larger groups of dysgraphic students and may also address other aspects of language beyond spellings. (pg. 57)

1.3 Statement of the problem

The findings of previous studies in Kenya (by Kiongo 2013 on dyslexia and Ondieki 2013 on dysgraphia) motivated this study to investigate whether there was any correlation between the amount of dyslexia-related language disorders and that of dysgraphia-related disorders. The current study sought to fill this gap. But this study went beyond this possible correlation to investigate three other aspects which were either not addressed at all by the two studies, or were addressed, but not in depth. The three aspects can be phrased in the following questions: Do dyslexic and dysgraphic children encounter the same amount of difficulty with both monosyllabic and polysyllabic words? Do they encounter the same amount of difficulty with content words and functional words? And do they experience different levels of difficulty depending on whether those words they are reading or writing occur in isolation or in context?

1.4 Objectives of the study

The objectives of this study were:

1. To determine the extent to which the subjects' reading disabilities were paralleled by writing disabilities.
2. To establish whether the linguistic context in which the words appeared affected the subjects' reading and writing ability.

3. To find out whether the reading difficulties are greater in functional words than content words.
4. To determine whether there were greater reading and writing difficulties in polysyllabic words than in monosyllabic words.

1.5 Justifications of the study

This study helps to highlight the plight of dyslexics and dysgraphics, a majority of whom go through primary and even secondary schools unrecognized, and unassisted, with, as a consequence, shattered dreams and unexploited talents on that part. The findings of this research are of importance to teachers, parents and policy makers. They help the teachers understand language factors that affect dyslexics and dysgraphics, and adjust their teaching approach for the benefit of all their learners.

Many people, including parents stigmatize children with language and other disorders. Ellis (1981:112) comments that, "Some 'normal' people are spectacularly poor at drawing, at remembering melodies, at remembering spatial layout of the environment, or at arithmetic skills. [This]… doesn't really matter much. It does matter a lot, however, if one of your inefficient modules is one of those required for learning to *read.* Illiteracy is both a stigma and an enormous inconvenience in the modern world, so developmental dyslexia causes great concern and generates large quantities of research." This study therefore informs and educates the readers that dyslexics and dysgraphics should be treated with respect, just like any other member of society. The findings of this study are expected to inform the Education Ministry of the situation, so as to enable them to formulate appropriate policies and devote funds to the benefit of this group of neglected disabilities.

This study is also a contribution to the body of knowledge on the language disorders. The findings of this research especially on the subjects' performance on functional and content words call for a reevaluation of the view that dyslexics and dysgraphics perform better in content words than function words-especially in a multilingual situation where the target language is a second language as was the case in this study. The approach adopted, studying language disorders together and not in isolation, will be of benefit to future researchers who may want to study the two disorders, dyslexia and dysgraphia, or any other of the language disorders. Other areas that require further research are suggested in my recommendations in chapter four.

1.6 Scope and limitations of the study

Even though the topic of this study is rather wide, covering both dyslexia and dysgraphia, it focused only on developmental dyslexia and dysgraphia among upper primary pupils of just a small area in Kenya. Some aspects which would have been of interest to this study were left out because of limitations of time and space. These include extending the research to other parts of Kenya, having gender as a variable, having age as a variable, and assessing the same subjects at another time to see if their performance on that day represented their real competence.

1.7 Literature review

Wanyoike (1978) investigated the presence of dyslexia in Kenya. Her research, conducted in eight Nairobi City Council 'High Cost' primary schools, identified dyslexia in some of the subjects. It supported the notion that different types of dyslexia rarely appear in isolation, and that there was a continuum of degrees of dyslexia. The current study sought to investigate its manifestation in subjects within a rural set up in what would be called 'low cost' schools.

Liberman et al (1980) tested good and poor readers in recall of meaningful and semantically anomalous sentences. They made a parallel comparison between conditions that did and did not offer opportunities for phonological confusions to occur. They found out that, unlike good readers, poor readers do not rely much on phonological strategy to memorize information. This view is also supported by

Shaywitz (2003) who argues that dyslexics match only a few letters in the word to their sounds, hence storing a distorted form of the word in their memory. In the current study, previously learnt words were used to test the subjects' reading and writing. This helped to identify the forms of words stored in their memory, hence compare their output in reading with that of writing.

Ombara (2008) found the existence of dyslexia among the students she assessed, and a general awareness of dyslexia among teachers, but little understanding of the broad facts on dyslexia. The study observed that little, if any, teacher training had been done on dyslexia, and that teachers had conflicting, misleading or in inaccurate facts about government policy on special education needs, although a few were aware of at least one policy. The study further noted that while physical handicap, mental retardation, audio and visual impairment had received a lot of focus from researchers, and a number of trained teachers in those disciplines, teacher training on dyslexia and related conditions had been widely ignored and unacknowledged. This study aims to equip teachers and policy makers with additional information on the language issues affecting dyslexics to enable them to detect dyslexia early and offer appropriate assistance.

Kiongo (2013) investigated cases of dyslexia in the reading ability of class-seven children at Thogoto Primary School in the Kikuyu district of Kenya. She found out that the pupils read monosyllabic words better than polysyllabic ones, and that they read Kiswahili better than English. They also had a challenge reading inflectional endings in words. The current study sought to compare the subjects' reading and writing of both monosyllabic and polysyllabic words to find out the degree to which there was correlation between the two.

Ondieki (2013) in her study of two dysgraphic children of the Ensoko Primary School, found that they made more deletion errors than any other types of errors. Function words were more affected by the deletion than content words. Kiongo (2013) found that both functional and content words were equally challenging to dyslexics. The present study sought to further research the performance of subjects on functional words, in both reading and writing

Andreou & Baseki (2010, 2012) studied dyslexic and non-dyslexic speakers of Greek as first language and English as second language. They compared their ability to write a story on the computer based on pictures. They found out that, in both languages, dyslexics made more mistakes than non-dyslexics did. Both groups made more phonological mistakes in English than in Greek, and more orthographic mistakes in Greek than in English. These findings were relevant to the current study, especially because they show that dyslexic characteristics can be manifested in writing, even when it involves typing on a computer keyboard, which this study sought to confirm.

Andreou &Tsela (2014) studied the difficulties in acquiring French as second language among dyslexics whose first language is Greek. They found that the Greek dyslexic students encounter difficulties in learning French as a foreign language and, their morphosyntactic abilities in both languages were weaker than those of non-dyslexic students. They found that for dyslexics, the native language skills appear to affect their ability to meet the demands of learning a second language. This was important to the current study which also examines a multilingual situation. The first language of the subjects under study, Lulogooli, differs in word structure, from English, and seems to affect some of the subjects' performance in reading and writing of English.

1.8 Theoretical frameworks: The magnocellular theory of dyslexia and the lexical and sub-lexical interaction model of spelling

The discussion of the present study's results will be informed by two theoretical frameworks: one for dyslexia and another for dysgraphia. As far as dyslexia is concerned, the study will use the magnocellular theory of dyslexia proposed by Stein and Walsh (1997) and for dysgraphia, the lexical and sub lexical model of spelling proposed by Rapp et al (2002) will be used.

1.8.1 The magnocellular theory of dyslexia (Stein & Walsh, 1997)

The magnocellular theory suggests that dyslexics have a problem in the magnocellular visual pathway, which is mainly tasked with processing moving visual information.[3] Stein (2011) explains that, "People inherit genes (we think there are at least nine genes) that give you a vulnerability to problems with reading. Those genes cause a problem with the development of a particular kind of nerve cell in the brain that is important for reading. These nerve cells are called magnocells. They are important for timing visual events and timing auditory events (for instance the sounds in speech). The cells are impaired in people with dyslexia, ADHD, developmental dyspraxia, developmental dysphasia (otherwise known as specific language impairment)…." Even though this is only referred to as a theory of dyslexia, this study in adapting it recognizes that it contains aspects that can equally account for the writing disorders as will be explained.

Rasmus et al (2003:843) write:

> The magnocellular theory (Stein &Walsh, 1997) postulates that the magnocellular dysfunction is not restricted to the visual pathways, but is generalized to all modalities (visual and auditory as well as tactile). Furthermore, as the cerebellum receives massive input from various magnocellular systems in the brain, it is also predicted to be affected by the general magnocellular defect.

The theory suggests a three tier representation of reading impairment, that is, the neurological level, the cognitive level and the behavioral level as represented on figure1 below. In partial adaption of the theory, this study makes assumptions of what happens at the neurological level, and focuses on the interface between the cognitive and the behavioral levels since the observations

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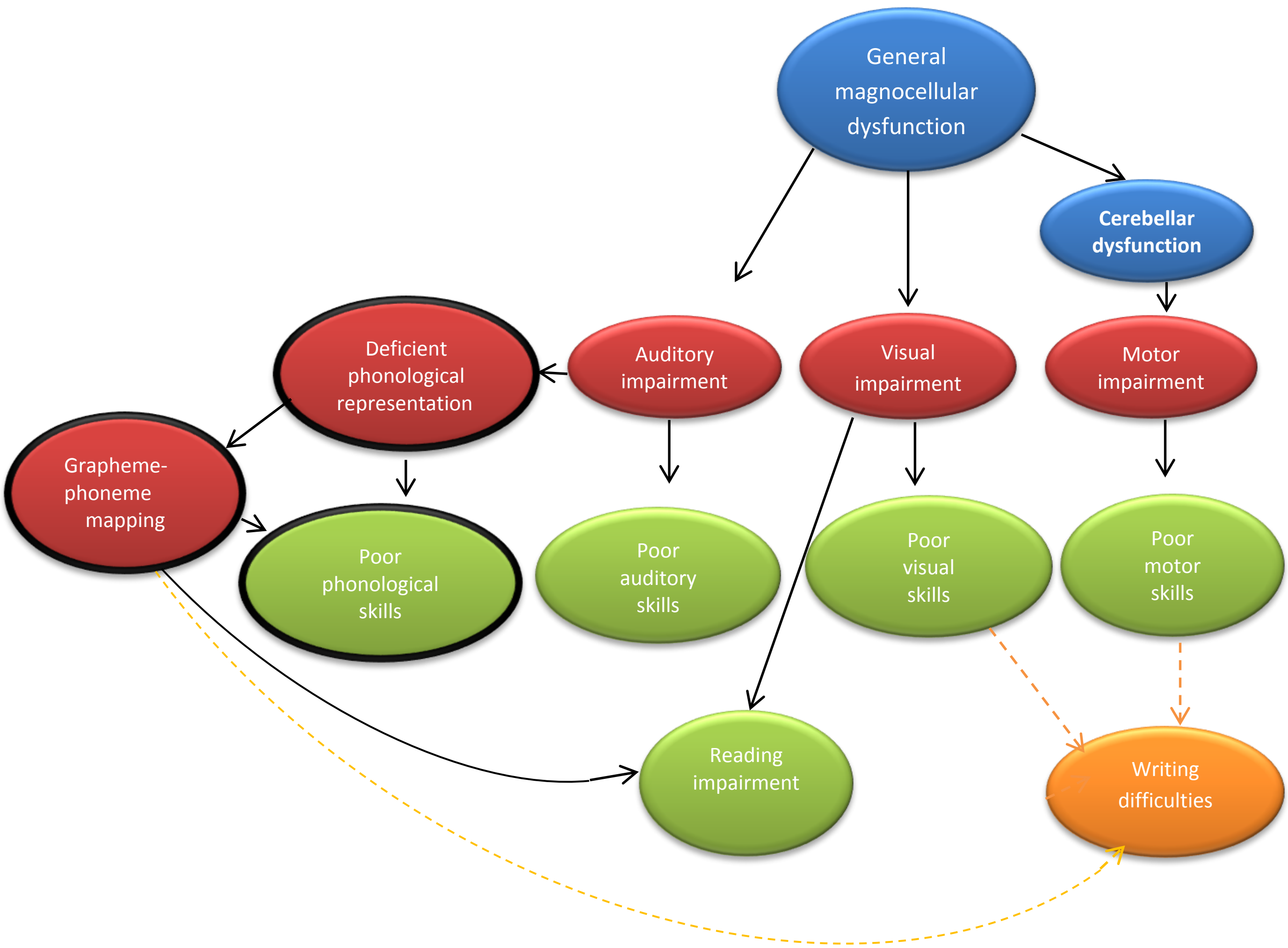
[3] Information obtained from Dyslexia Help Website 'Beating Dyslexia.' URL http://www.beatingdyslexia.com/causes_dyslexia.html

made on the subjects of this study centered mainly on the linguistic output (behavioral level), with speculations made on the cognitive implications, basing on available knowledge in the field of linguistics.

A major evidence of dyslexia, according to the general magnocellular dysfunction (GMD), is difficulty in grapheme-phoneme mapping resulting from deficient phonological representation caused by auditory impairment. Some scholars (Dickie et al, 2013; Ramus, 2003; Snowling, 2001) treat this separately as the phonological theory of dyslexia. On figure 1, it is represented by the bubbles with a thick black outline. Most of the subjects in this study displayed poor mastery of the grapheme-phoneme mapping for example, the word *bite* was read as *bit* in 46%of the responses, and 24% read the initial sound /kjʊ/in *cure* as /kʊ/ when reading in isolation. This was very important to this study as we realize similarities with their writing as is explained below. This theory also suggests that, (GMD) can result into visual impairment which is one of the causes of reading impairment. This is evidenced in the subjects' errors of transposing and substituting letters while reading, for example subject EIC read *knife* as *knife* and ELM read *over* as *love*.

Fig 1: The general magnocellular theory of dyslexia.[4]



[4] Adapted from Rasmus (2003) and slightly modified, by addition of the orange bubble and arrows, to cater for dysgraphia. The bubbles represent impairment at the neurological level (blue), at the cognitive level (red) and at the behavioral level (green/ orange).

Even though this study focused mainly on the spelling aspect of dysgraphia, and not on the handwriting and letter shapes, it is worth noting that apart from accounting for dyslexia, the GMD can account for those aspects of dysgraphia. The theory recognizes that visual impairment also results in poor visual skills which, this study argues, may also cause writing difficulties as evidenced by mirror images, omissions and inversions of words and letters. Some subjects wrote mirror images of words or letters, or at times inverted the letters within a word. For example, GKA wrote '*tiran*' for *train* and '*knief*' for *knife*. LSB wrote '*thorw*' for *throw* and LCD wrote *handkerchief* as '*habcheif*'. This was represented in figure 1 by the diagonal dotted orange arrow. The theory also suggests that GMD causes cerebellar dysfunction, which impairs motor movement and results into poor motor skills. Hendrickx and Salter (2009:107) say that, dysgraphia "… is generally thought to be a motor coordination difficulty, but can be associated with processing and sequencing…and also with other fine motor skills issues…." This is represented on figure 1 by the vertical dotted orange arrow. Improper sequencing of letters and irregularly shaped letters in words was common among the subjects of this study, for example subject EKE writes *knife* as *knef* GKA writes *train* as *tiran* LSB writes *throw* as *thorw*.

1.8.2 The lexical and sub-lexical interaction model of spelling (Rapp et al, 2002)

Rapp, Epstein, and Tainturier (2002) proposed a model which assumes that spelling is achieved through interaction between two processes, that is, the lexical process, which contains phonological, semantic and orthographic information, and the sub-lexical or non-lexical process, which interprets the relationship between phonemes and graphemes. In this connection, Tainturier &Rapp (2004:122) say this:

> According to most current theories, spelling involves at least two sets of processes [Fig. 2]. First, a spelling can be generated sub-lexically by relying on knowledge of the frequent correspondences between phonemes and graphemes. This sub-lexical phonology to orthography conversion process generates plausible spellings for both familiar and unfamiliar words (or pseudo words). However, the output may not be entirely accurate in orthographically opaque languages such as

English because many words have an ambiguous or irregular spelling (e.g., the word ‘‘phone’’ could be spelled ‘‘fone’’). Second, the spelling of familiar words can be generated lexically, by accessing a stored representation of the spelling of words in an orthographic lexicon. This would allow familiar words to be spelled correctly. Although it can be assumed that the spelling of nonwords is mostly generated sub-lexically while that of familiar words is mostly generated lexically, lexical and sub-lexical processes will jointly contribute to the activation of a set of abstract graphemic units.

It is evident from this theory that spelling is a complex cognitive process that involves interaction between different linguistic units. The current study focused mainly on the orthographic linguistic output of the subjects, and comparing it with the phonological input in a dictation. Though this theory recognizes the semantic level as part of the spelling process, less reference has been made to it here, as semantics was beyond the scope of this study. The target language in the current study, English, is also recognized to pose a challenge because of its irregular spelling system. This was particularly challenging to the subjects because they could not rely on phoneme-grapheme conversion to generate correct spellings. This was exemplified in many of the subjects’ spelling errors, for example, 40% of the respondents wrote letter ‘k’ as the initial letter in the word *cure,* most of them writing the word as *kiwa.* Only two respondents managed to write the word fence because of its irregular final consonant sound. All the subjects had a problem with diphthongs represented in writing by one letter, and they often filled in another letter so that the letters match with the sounds in the word. The word *bite* was written as *bait* by 20% of the respondents, and similar occurrences were experienced in words such as *right* which some wrote as *rait,* and *knife* which was written as *naif* or *naifu* by some. These examples showed that the subjects had poor mastery of the phoneme-grapheme conversion rules. A similar phenomenon is experienced in dyslexics where grapheme-phoneme conversion is also problematic (Snowling 1981:220), a position corroborated by the subjects of this study. These similarities between reading and writing disorders supported the first hypothesis of this study which predicted a correlation between reading and writing. This theory also suggests that the graphemic layer acts as a buffer, within the sub-lexical process. Tainturier &Rapp (2004:123) point out that "[Buffer] deficits typically lead to letter substitutions, omissions, additions and transpositions that are taken to reflect the disruption of information about letter identity and order that occurs when the graphemic buffering capacity has been compromised." Almost all the errors made by the respondents in this study fall in this category, showing that the subjects had a problem in the sub-lexical process.

An attempt by the subjects of this study to generate the spellings lexically also proved futile as the forms written contained a lot of distortions evidenced by omissions and transpositions of letters, for example, a subject BOT wrote *spelling* as *spilnge* and HMN wrote it as *spellng,* EKE wrote *envelope* as *naveleope*. The forms written by these respondents prove that they had a form of the target word stored in their mind, but the stored forms of words were not accurate. The subjects produced similarly distorted forms in reading. Shaywitz (2003:111) acknowledges that this is a major characteristic of dyslexia. Here, we also see similarities between dyslexia and dysgraphia. Joint generation of spellings from the lexical and sub-lexical process resulted in confusion, where some words were assigned wrong letter combinations, but which produced sounds similar to the expected ones, for example, subject HMC writes *remember* as *remembur*, *bite* as *buyt*, and *train* as *trayn*.

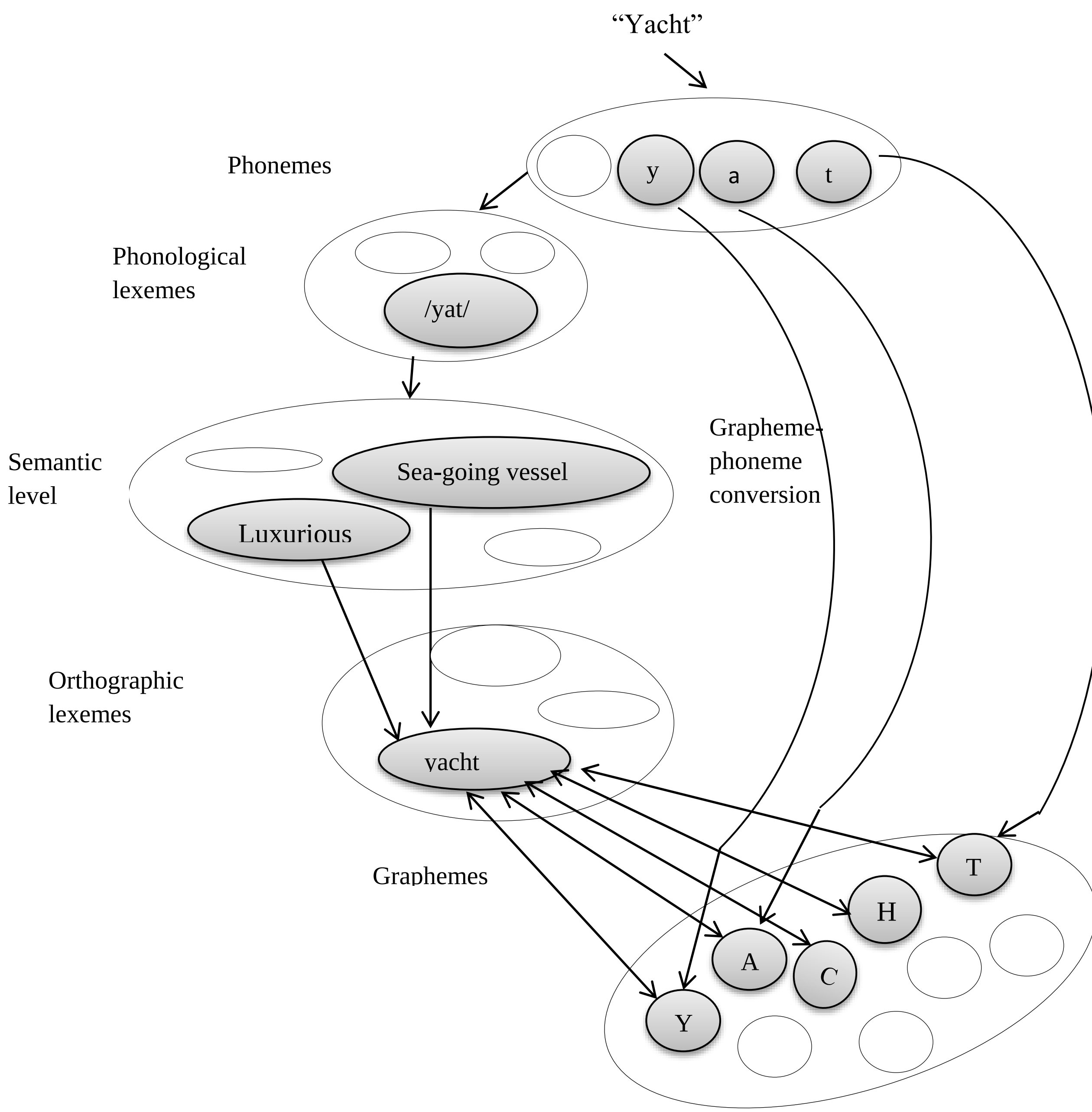


Figure 2: Schematic representation of the functional architecture of the spelling system that allows for lexical/sub-lexical integration[5]

[5] Adapted from Rapp et al (2002:18)

Miceli & Capasso (2006:118) give the following summarizing description of the model in figure 2:

> [This model] assumes that word production requires a meaning layer, a lexeme layer, and a segment layer. Information flows uni-directionally from the meaning to the lexeme layer, but bi-directionally between the lexeme and the segmental layer. In order to simulate spelling, a phoneme–grapheme conversion layer is added. When a word is dictated, information retrieved in the meaning layer activates a lexeme-level representation, which in turn activates segments in the grapheme layer. At the same time, the input string is processed by phoneme–grapheme conversion rules, which also feed information to the grapheme layer. Information feeds back from the grapheme to the lexeme layer, and the interaction between these two layers eventually leads to encoding the output string.

The theory posits that in 'normal' people, the lexical process is sufficient to produce correct spellings. Such people may also benefit from a combination of both the lexical and the sub-lexical process to achieve accurate spelling. However, among those who are impaired, especially along the lexical process, the weak lexical activation fails to activate some of the graphemes in some words.

1.9 Hypotheses of the study

Based on the observations made in the background to the study, on the questions raised in the statement of the problem, on the objectives of the study, on the review of the existing literature and on the predictions on the two theoretical frameworks, the present study decided to test the following hypotheses:

1. There will be a positive correlation between the subjects' reading disabilities and writing disabilities.
2. Words presented in context will be read more easily than those presented in isolation.

3. Words presented in context will be written more easily than those presented in isolation.
4. Functional words will cause greater difficulty in reading than content words.
5. Functional words will cause greater difficulty in writing than content words.
6. Monosyllabic words will be read more easily than polysyllabic ones.
7. Monosyllabic words will be written more easily than polysyllabic ones.

1.10 Methodology

1.10.1 The subjects

The subjects were class 5 to class 8 pupils from nine public primary schools in Sabatia sub-county. For selection of the schools, I used purposive sampling, basing on the geographical distance between the schools. The Sabatia sub-county is divided into two divisions: Sabatia and Chavakali. First, four schools were selected form each division. The selected schools were at least five-kilometres apart. From Chavakali, the selected schools were Hamuyundi, Endeli, Bukulunya and Demesi, while Budaywa, Simboyi, Gahumbwa, and Kivuye were selected from Sabatia. The ninth school, Egaloni from Chavakali division, was included to cover an area that was unrepresented by the earlier selection. Details about the date data was collected and the number of pupils per school are presented in table 1 below.

The pupils were identified as dyslexics and dysgraphics by their teachers, who found their reading and spelling age much lower than was expected of their chronological age and according to the Ministry of Education's expectations. I then administered a reading test which involved reading words from the English syllabus for Standard Two and a free composition, to the group selected by the teachers. Twenty-five pupils, six of whom were girls, who could not read above

30% of the words and whose compositions had more than ten spelling mistakes, were selected to be the subjects of this study. The study assumed that, since the items tested were selected from work which had been taught to the pupils more than two grades earlier, all the pupils above class five were supposed to be conversant with the words. The level of education was, therefore, not a variable in this study and the subjects were tested as one group regardless of the differences in academic level. The subjects aged between ten and sixteen years. For the purposes of this study, the full names of the pupils were omitted (in the results tables and in subsequent chapters); they were replaced with the initials of their name(s), preceded by an initial representing their school.

Table 1: Data collection time schedule

	Date	School visited	Division	No. of pupils
1	30/3/2016	Hamuyundi	Chavakali	4
2	31/3/2016	Demesi	Chavakali	1
3	1/4/2016	Endeli	Chavakali	5
4	4/4/2016	Bukulunya	Chavakali	4
5	5/4/2016	Kivuye	Sabatia	1
6	5/4/2016	Gahumbwa	Sabatia	2
7	6/4/2016	Simboyi	Sabatia	2
8	6/4/2016	Budaywa	Sabatia	1
9	7/4/2016	Egaloni	Chavakali	5
Total				25

1.10.2 Data elicitation and collection procedure

Two word lists and a list of eleven sentences were used in this study. The first word list (see Appendix I) contained twenty words, half of which were monosyllabic and half polysyllabic. This list was used to compare the subjects' reading and writing of monosyllabic words versus polysyllabic ones. The second list consisted of the same words in list 1 but presented in context, specifically in sentences (see Appendix II). The ten functional words used in this study were also presented in the sentences in the second list. The content words read and written in context in the second list were compared with those read and written in isolation in the first list. The second list also contained data that was used to compare the subjects' reading and writing of functional words with their reading and writing of content words. The third list (in Appendix III) contained ten nonsense words which were presented to the participants to read, in order to test their mastery of grapheme-phoneme conversion rules. The content of the written tasks was identical to that of the reading tasks. That is, identical words and sentences were presented in both the reading and writing exercises to test whether there was consistence in the errors committed.

Apart from the nonsense words, all the other words were selected from the Kenya Institute of Curriculum Development (KICD) syllabus for primary schools. The words were selected from the list of vocabulary and the grammar items for Standard Two and Standard Three. This is at least two grades below the academic level of the subjects of this study. It is expected that all the subjects had previously encountered the words used in this study, having gone through those classes. The reading tasks were presented to the subjects first and each participant performed the reading tasks individually and away from the rest. Their reading was recorded using a voice recorder. The participants first read the words in isolation, then the nonsense words and thirdly the words in context. For the writing tasks, the words and sentences were dictated to the whole group of subjects within each school. The order of presenting the writing tasks was the same as that used in the reading tasks.

1.10.3 Data Analysis procedure

The subjects' production on both reading and writing was transcribed from the tapes and presented in tables. These tables show the correct responses and their percentages for every word and also for every participant. The mean performance for each category of words (monosyllabic, polysyllabic, nonsense, and functional words) on both the reading and writing tasks was calculated. To test the first hypothesis, Pearson's correlation test was applied to the scores on reading and those on writing. The details of how it was tested were postponed until the end of chapter three. To test the other six hypotheses, the chi-square test was used to compare the frequencies of the subjects' correct reading and correct writing.

CHAPTER TWO: PRESENTATION AND DISCUSSION OF THE RESULTS ON DYSLEXIA

2.1 Presentation of the results

This chapter presents and discusses the results produced from the reading tasks presented to the subjects. The results are first presented in tables, according to the kind of words the subjects had to read, so, there are tables on nonsense words, monosyllabic English words read in isolation , monosyllabic English words read in context, polysyllabic English words read in isolation, polysyllabic English words read in context, functional words read in context and a table on the summary of the subjects' performance in the reading tasks, then, the statistical tests used to test the study's hypotheses are reported.

2.1.1 Tables of the results

The results are presented in seven tables: one, on the Subjects' reading of nonsense words (See Table 2); two, the subjects' reading of monosyllabic English words in isolation (See Table 3); three, the subjects' reading of monosyllabic English words in context (See Table4); four, the subjects' reading of polysyllabic English words in isolation (See Table 5) five, the subjects' reading of polysyllabic English words in context (See Table 6); six, the subjects' reading of functional words in context (See Table 7); and seven, summary of subjects' reading (see Table 8)

Table 2: The Subjects' reading of nonsense words

Target word → Subjects ↓		deat	kight	bry	nure	pake	gare	bave	foon	plaw	tife	Correct readings	%
1	BEF	det	kin	bri	nigh	pick	grei	bav	fon	c	thief	1	10
2	BK	det	kind	bry	near	peck	creen	bave	foon	plough	thief	0	0
3	BME	det	kalve	bal	nure	pick	garr	bav	c	pew	tif	1	10
4	BOT	det	kigh	bra	nur	peak	gra	bave	fon	play	tif	0	0
5	DAS	det	kint	boit	night	poke	gare	biv	for	plant	tifs	0	0
6	EIC	deeti	kaishiti	barasha	nure	peke	gari	beve	fooni	peliwa	tife	0	0
7	EIJ	dat	kirr	barr	nerr	pak	gar	bove	far	lap	Tif	0	0
8	EKE	det	kid	dei	nor	peg	gar	bave	from	-	tif	0	0
9	ELM	bad	knife	buy	women	pastime	gar	lie	food	pat	life	0	0
10	EMS	deti	kigiliti	baraya	nia	pake	gare	basi	foni	biwa	tivu	0	0
11	GKA	c	kelled	ba	nir	peak	gat	biv	font	plea	tif	1	10
12	GMH	det	kid	ram	nor	pack	craw	ball	fon	pral	tif	0	0
13	HAP	deat	kid	buy	hurne	pake	gren	bav	from	ply	tif	0	0
14	HMC	c	kint	bye	nile	park	garr	bave	fon	play	tif	1	10
15	HMH	dirt	kimt	bye	now	park	go	bave	food	plough	tif	0	0
16	HMN	deati	kit	bye	nurse	pork	gore	bare	fon	plough	tif	0	0
17	KMV	dirt	kit	be	nur	park	gar	bav	fon	bew	tough	0	0
18	LBN	det	kite	berry	nut	park	garr	bav	roof	ple	tif	0	0
19	LCD	dont	king	by	nure	paka	gari	boli	foni	pin	tef	0	0
20	LIA	det	king	buy	nee	park	ger	bave	fon	ply	tif	0	0
21	LNB	det	kit	but	net	peak	gra	have	to	play	dife	0	0
22	LSB	death	grabs	grare	naya	c	c	c	fun	below	tef	3	30
23	SAB	det	kife	bet	reap	cat	goal	but	for	play	tough	0	0
24	SKS	dont	not	right	nur	pak	gun	bore	c	pull	tough	1	10
25	VMH	diit	kinife	dry	nurse	c	gerr	c	c	play	tif	3	30
Total of correct readings		2	0	0	0	2	1	2	3	1	0	11	
%		8	0	0	0	8	4	8	12	4	0		4.4

Note: The letter 'c' represents a correct response by the subject.

Table 3: The subjects' reading of monosyllabic English words in isolation

Target word → Subjects ↓		Bite	right	train	neat	knife	knee	fence	throw	tree	cure	Correct readings	%
1	BEF	bet	ring	c	det	kinf	kin	fan	try	c	creint	2	20
2	BK	bet	ring	tan	c	c	kenel	fake	c	c	care	4	40
3	BME	bet	ring	tai	not	c	ken	fent	Kin	clear	kurr	4	40
4	BOT	bet	root	c	net	key	key	fe	trow	c	car	2	20
5	DAS	bat	rit	tree	next	neck	live	believe	-	c	cavs	1	10
6	EIC	bati	ragas hditi	taraina	neati	ranife	kanei	fenike	tarew a	tarai	kure	0	0
7	EIJ	bat	rit	-	net	c	gar	for	wor	c	car	2	20
8	EKE	det	rit	tin	eat	c	ke	fal	trow	c	crol	2	20
9	ELM	bit	c	stasding	nest	c	knife	friend	those	three	c	3	30
10	EMS	bitu	rati	tirini	hati	kinifu	kinihi	fonisi	tirawa	c	sira	1	10
11	GKA	dint	c	tried	neati	c	killed	filt	try	c	keld	3	30
12	GMH	bet	rihat	tran	net	c	ki	fetch	trow	three	crow	1	10
13	HAP	beta	read	trin	neati	kif	ken	fake	trow	tre	kur	0	0
14	HMC	bit	rit	c	net	klimf	ki	c	c	c	kure	4	40
15	HMH	bat	read	train	night	kinf	ken	fan	try	tred	c	1	10
16	HMN	bat	light	c	net	c	ken	pencil	trow	c	c	4	40
17	KMV	bit	c	tain	net	c	kins	fitch	toff	c	curr	3	30
18	LBN	bit	c	train	net	c	neat	sif	trow	c	car	3	30
19	LCD	bit	light	ten	not	kif	kare	famine	tan	tar	car	0	0
20	LIA	bit	rint	c	c	kinf	key	fee	trow	tiv	kur	2	20
21	LNB	bit	light	tret	c	c	nei	friend	event	nit	crawl	2	20
22	LSB	bit	c	tran	net	c	kin	face	thrau	c	cow	3	30
23	SAB	c	c	try	hight	c	keyl	four	try	c	kite	4	40
24	SKS	c	c	tin	tight	c	know	fish	throut	c	kin	4	40
25	VMH	bit	c	c	net	c	kin	face	tram	c	kure	4	40
Total of correct readings		2	8	6	3	15	0	1	2	16	3	56	
%		8	32	24	12	60	0	4	8	64	12		22.4

Table 4: The subjects' reading of monosyllabic English words in context

Target word → Subjects ↓		Bite	right	train	neat	knife	knee	fence	throw	tree	cure	Correct readings	%
1	BEF	bit	ring	c	net	kife	ki	fin	c	c	car	3	30
2	BK	bit	ring	c	nead	c	kenel	c	c	c	can	5	50
3	BME	bat	rang	tai	in	c	hic	face	dav	c	ure	2	20
4	BOT	bit	rit	c	int	kin	kein	c	trow	three	car	2	20
5	DAS	bit	rit	tan	tin	kivs	ke	even	that	thrin	foo	0	0
6	EIC	rite	ronig ashi	tirinti	neati	kinfe	kanigi	venike	darowa	tirei	kura	0	0
7	EIJ	bit	ret	c	-	c	ke	fan	thewul	c	car	3	30
8	EKE	c	c	trin	it	c	kel	en	niu	c	-	4	40
9	ELM	tri	raik	rait	ta	c	kinife	life	those	three	c	2	20
10	EMS	diti	rati	tarini	niti	kinifi	kenli	foli	therawa	c	siuri	1	10
11	GKA	bint	c	trade	-	c	ker	field	try	c	caused	3	30
12	GMH	bit	-	tran	nut	c	kin	fake	even	c	car	2	20
13	HAP	bat	-	c	zit	kif	ke	from	the	the	kim	1	10
14	HMC	bit	ring	c	nut	kinife	klin	finis	c	c	gum	3	30
15	HMH	bit	rig	tried	net	kef	ken	fu	the	trei	c	1	10
16	HMN	bit	c	c	net	c	kan	c	trow	c	c	6	60
17	KMV	bit	light	the	net	c	kin	fiths	tow	c	kavis	2	20
18	LBN	bit	c	treini	c	c	c	face	trow	c	car	5	50
19	LCD	bit	hedte	ten	now	kabs	kin	famine	they	-	come	0	0
20	LIA	bit	c	tree	net	kinif	ke	fin	tru	c	car	2	20
21	LNB	bit	c	raiti	c	c	kins	frame	they	c	can	4	40
22	LSB	bit	c	tran	net	c	kin	c	traut	c	cram	4	40
23	SAB	cut	c	transport	now	c	key	-	this	c	the	3	30
24	SKS	c	c	turn	c	c	known	c	c	c	care	7	70
25	VMH	-	c	c	net	c	kin	face	trau	c	kiu	4	40
Total of correct readings		2	10	8	3	15	1	5	4	18	3	69	
%		8	40	32	12	60	4	20	16	72	12		27.6

Table 5: The subjects' reading of polysyllabic English words in isolation

Target word → Subjects ↓		handkerchief	handwriting	Reme-mber	engine	vehicle	secretary	spelling	envelope	environment	interesting	Correct readings	**%**
1	BEF	c	hardworking	c	english	vycle	security	spling	evelop	c	instring	3	30
2	BK	c	hardworking	c	english	village	sectri	spring	envalep	invited	Insect	2	20
3	BME	c	hardwork	c	english	village	cite	in	van	c	injection	3	30
4	BOT	c	hardworking	c	english	village	security	spring	evelop	evlirime	Intris	2	20
5	DAS	headteacher	headwrit	c	egiv	hiven	christive	secretary	evenlet	eviroment	electricity	1	10
6	EIC	sajikef	fushanikeva	remiba	inagane	vashikile	sekaretirsha	sebeliinga	inivelopi	ivarnimenita	initeresitini	0	0
7	EIJ	hadekofi	c	engineer	engineer	vase	sheria	pla	evripla	retipla	interisi	1	10
8	EKE	depchif	dewe	c	lang	volspok	screen	spril	elvp	elv	Itri	1	10
9	ELM	hasheding	haswith	randing	english	visitation	science	sharpener	elepath	intelivision	Inin	0	0
10	EMS	nanadikarachifu	anadawaratira	ramemidera	engilini	viichahi	shalisilitaya	sipelija	enevihiope	enevirimeti	initarasiti	0	0
11	GKA	c	hadwriting	c	english	c	sentrinty	spet	invipo	c	intriticiency	4	40
12	GMH	c	hadren	c	english	vihel	secondary	spell	c	inviroment	c	4	40
13	HAP	hakchif	hodie	c	engren	leva	scree	spillesk	evope	evront	instring	1	10
14	HMC	c	handwritig	rememba	engr	veincle	spill	spillens	evenlop	iviront	c	2	20
15	HMH	andkachif	andwriting	rimbre	c	vaile	seretia	spelnt	evlope	envirent	Intrest	1	10
16	HMN	hadchief	c	c	c	vils	security	c	evalope	c	intereting	5	50

17	KMV	c	handwait	raba	engin	vich	subject	swept	-	in	intrasatis	1	10
18	LBN	headteacher	hardwriting	c	again	vehicles	security	spin	evryeope	eviroment	c	2	20
19	LCD	c	c	ribi	englis	vishi	sisten	shepling	people	emenment	intempon	2	20
20	LIA	-	hadwas	c	en	vec	sectary	c	enlap	endviron	c	3	30
21	LNB	c	hardwrite	remind	let	resh	sleep	speaking	eveny	neat	Indent	1	10
22	LSB	c	handwrite	c	inge	c	security	c	envebo	c	Instret	5	50
23	SAB	c	hardwork	c	egzite	c	spill	spill	egzite	exited	Intesti	3	30
24	SKS	headchief	c	c	english	virus	scattered	spring	invite	c	inviting	3	30
25	VMH	c	handwrit	c	ngen	vichil	security	c	evelope	everomete	instrest	3	30
Total of correct readings		13	4	16	2	3	0	4	1	6	4	53	
%		52	16	64	8	12	0	16	4	24	16		21.2

Table 6: The subjects' reading of polysyllabic English words in context

Target word → Subjects ↓		handkerchief	handwriting	Remember	engine	vehicle	secretary	spelling	envelope	environment	interesting	Correct readings	%
1	BEF	c	hardworking	c	en	vit	security	spling	envilment	c	instring	3	30
2	BK	c	hardworking	c	c	village	sectrali	sleep	evop	invite	intext	3	30
3	BME	c	hardwork	rimba	english	vaan	sfet	sip	invilopi	c	-	2	20
4	BOT	c	hardwiting	c	c	viklas	sectary	c	invelopi	iniviroment	c	5	50
5	DAS	ristachifs	inrantis	c	inven	vallet	read	lin	invanpli	even	itan	1	10
6	EIC	shanikerafe	shaidiwaitiniga	tirinti	ingin	feshikile	sekaretiraya	shepilinega	nevilipe	ineviwanimenti	Inaterasitiiga	0	0
7	EIJ	headinkasha	c	remove	gun	vice	sing	singing	anhelpe	evno	inast	1	10
8	EKE	dachif	aniut	c	elel	val	us	-	elelik	ent	niti	1	10
9	ELM	headteacher	haswith	ithare	eit	verelo	sen	ship	tlopa	riks	let	0	0
10	EMS	andkachif	hanaweratini	ramedera	enajina	vilisi	siritini	sipeliliga	ehenvelipe	enevurimeti	Nitutarastiki	0	0
11	GKA	c	hadwriting	c	head	viko	secuincy	speak	venlipo	c	inteticien	3	30
12	GMH	c	hardret	c	egg	vihen	secondary	spreng	even	c	Intrad	3	30
13	HAP	hakichif	handweed	rembe	gei	vil	same	spen	evempt	eviring	Theste	0	0
14	HMC	c	handrating	ramba	c	viclon	scrite	c	envelep	envirionant	c	4	40

15	HMH	handcraf	awindrik	tred	it	van	seit	spelt	c	evromet	Int	1	10
16	HMN	hadkerchief	c	c	engineer	well	security	c	elvelopme	c	c	5	50
17	KMV	c	atwit	rei	evening	vite	subject	sapn	it	in	Intra	1	10
18	LBN	hadkitchen	c	c	again	visco	security	spill	evelop	everoment	c	3	30
19	LCD	hedecam	mauma	liman	inga	vek	wens	sheptshe	gau	givent	inshang	0	0
20	LIA	rudike	hardwan	c	en	veis	ski	c	avelop	anveroment	interesting	2	20
21	LNB	headchief	heditre	left	hit	vens	lest	speaking	ivilu	even	indeting	0	0
22	LSB	c	c	c	egg	c	security	c	envelevo	c	Instret	6	60
23	SAB	c	working	c	exited	c	story	whatwas	aeroplane	exited	inveribook	3	30
24	SKS	headchief	c	c	english	virus	scattered	spring	invite	c	inviting	3	30
25	VMH	c	andwating	c	ingen	vife	security	c	evelope	iveromet	Istrech	3	30
Total of correct readings		11	5	14	3	2	0	6	1	7	4	53	
%		44	20	56	12	8	0	24	4	28	16		21.2

Table 7: The subjects' reading of functional words in context

Target word → Subjects ↓		cannot	that	over	an	us	very	don't	there	for	I	Correct readings	%
1	BEF	c	c	c	c	use	c	c	c	c	c	9	90
2	BK	can	the	c	a	use	c	c	c	c	c	6	60
3	BME	conbak	dov	ov	-	use	c	c	the	if	e	2	20
4	BOT	can	the	c	a	use	every	do	the	of	c	2	20
5	DAS	c	c	inven	-	-	every	igoot	the	from	-	2	20
6	EIC	c	dati	overa	i	usa	vera	idonti	tira	ofo	e	1	10
7	EIJ	cant	hat	hare	-	use	every	going	the	of	c	1	10
8	EKE	ca	this	or	new	use	c	new	the	of	in	1	10
9	ELM	can	that	love	at	c	c	my	c	c	c	5	50
10	EMS	can	ndeti	aho	c	usi	via	bihon	therai	furi	a	1	10
11	GKA	c	c	c	a	c	doit	c	c	c	-	7	70
12	GMH	can	c	oven	a	is	rent	c	trun	for	c	3	30
13	HAP	gan	-	-	-	doi	-	-	-	were	thema	0	0
14	HMC	canot	c	c	c	don	in	c	c	wan	c	6	60
15	HMH	is	-	c	the	bad	is	c	c	wa	c	4	40
16	HMN	c	c	c	c	c	c	c	c	c	c	10	100
17	KMV	coconut	the	all	-	use	vil	donot	the	of	in	0	0

18	LBN	c	c	c	a	c	c	c	c	c	c	9	90
19	LCD	was	den	all	c	use	wen	dono	thru	c	c	3	30
20	LIA	annot	c	avery	a	use	c	c	thi	c	c	5	50
21	LNB	c	not	c	a	use	c	not	this	from	c	4	40
22	LSB	cant	c	c	a	has	c	c	c	c	c	7	70
23	SAB	-	the	-	the	-	very	do	the	-	-	0	0
24	SKS	cant	c	c	c	c	c	c	c	c	c	9	90
25	VMH	c	tank	of	our	use	c	do	the	of	c	3	30
Total of correct readings		8	10	11	6	5	12	12	10	10	18	102	
%		32	40	44	24	20	48	48	40	40	72		40.8

Table 8: Summary of the subjects' reading.

	in isolation	in context	Total	%
Monosyllabic	22.4	27.6	50	25
Polysyllabic	21.2	21.2	42.4	21.2
Total	43.6	48.8	92.4	
%	21.8	24.4		23.1

2.1.2 Statistical tests related to dyslexia

This section presents calculations carried out to ascertain the statistical significance of the results obtained in testing three hypotheses, (i.e. hypothesis 2, 4 and 6). The layout of the statistics and the interpretation of the results follow the critical values approach.

The second hypothesis of this study said that words presented in context would be read more easily than those presented in isolation. The calculation of its chi-square (X^2) is done below.

Table 9: Frequency of correct pronunciations of words read in isolation and words in context

	Correctly read				
	Yes		No		Total
	fo	*fe*	*fo*	*fe*	
Words read in isolation	109	(115.5)	391	(384.5)	500*
Words read in context	122	(115.5)	378	(384.5)	500*
Total	231**		769**		Grand total 1000

Key[6]: *fe* = expected frequencies *Σ *f* column

fo= observed frequencies **Σ *f* row

The chi-square (X^2) is calculated below.

$$X^2 = \Sigma \left[\frac{(fo - fe)^2}{fe} \right]$$

[6] The key above applies to tables 9, 10, 11, 18, 19, 20.

$$= \frac{(109 - 116)^2}{116} + \frac{(391 - 385)^2}{385} + \frac{(112 - 116)^2}{116} + \frac{(378 - 385)^2}{385}$$

$$= \frac{49}{116} + \frac{36}{385} + \frac{36}{116} + \frac{49}{385}$$

$$= 0.42 + 0.09 + 0.31 + 0.13$$

$X^2 = 0.95$

Degrees of freedom = (rows -1) (columns -1 = (2-1) (2-1) =1

The study's fourth hypothesis said that functional words would cause greater difficulty in reading than content words. Below is a calculation of its chi-square (X^2) test.

Table 10: Frequency of correct pronunciations of functional words and content words

	Correctly read				
	Yes		No		Total
	fo	*fe*	*fo*	*fe*	
Functional words	11	(44.3)	239	(205.7)	250*
Content words	122	(88.7)	378	(411.3)	500*
Total	133**		617**		Grand total 750

$$X^2 = \Sigma \left[\frac{(fo - fe)^2}{fe} \right]$$

$$= \frac{(11- 44.3)^2}{44.3} + \frac{(239 - 205.7)^2}{205.7} + \frac{(122-88.7)^2}{88.7} + \frac{(378 – 411.3)^2}{411.3}$$

$$= \frac{1108.89}{44.3} + \frac{1108.89}{205.7} + \frac{1108.89}{88.7} + \frac{1108.89}{411.3}$$

$= 25.03 + 5.39 + 12.50 + 2.70$

$X^2 = 45.62$

Degrees of freedom = (rows -1) (columns -1)

= (2-1) (2-1)

=1

The study's sixth hypothesis said that monosyllabic words would be read more easily than polysyllabic ones. Its chi-square (X^2) calculation was as follows.

Table 11: Frequency of correct pronunciations of monosyllabic and polysyllabic words

	Correctly read				
	Yes		No		Total
	fo	*fe*	*fo*	*fe*	
monosyllabic	125	(111.5)	375	(384.5)	500*
polysyllabic	106	(115.5)	394	(384.5)	500*
Total	231**		769**		Grand total 1000

$$X^2 = \Sigma \left[\frac{(fo - f_e)^2}{fe} \right]$$

$$= \frac{(125 - 115.5)^2}{115.5} + \frac{(375 - 384.5)^2}{384.5} + \frac{(106-115.5)^2}{115.5} + \frac{(394-384.5)^2}{384.5}$$

$$= \frac{90.25}{115.5} + \frac{90.25}{384.5} + \frac{90.25}{115.5} + \frac{90.25}{384.5}$$

$$= 0.78 + 0.23 + 0.78 + 0.23$$

$X^2 = 2.02$

Degrees of freedom = (rows -1) (columns -1)

= (2-1) (2-1)

=1

2.2 Discussion of the results

2.2.1 The subjects reading of nonsense words

The data in table 1 indicates that the subjects managed to read only 4.4 % of the nonsense words presented to them. Eighteen (i.e. 9%) of the 25 subjects were unable to read any of the ten words correctly, five could read only one word, and two read only three. The subjects found it difficult to read most of the words according to the grapheme-phoneme rules (i.e. rules which govern the correct pronunciations of letter combinations in a particular language). Out of the twenty-five subjects, twenty (i.e. 80%) read the sound /ai/in the word *tife* as /i/ and eleven read *deat* as *dit*. This difficulty with simple nonsense words is recognized as a characteristic of phonological dyslexics and deep dyslexics (see Crystal, 2010:262 and Ellis, 1984:115). This study found the responses of some subjects (for instance EIC, EMS, LCD and VMH) to be an indication of surface dyslexia. For example, EIC reads *kight* as *kaishiti*, *plaw* as *peliwa* and *foon* as *fooni*, while EMS reads *kight* as *kigiliti*, *bry* as *baraya*, and *foon* as *foni*. Crystal (2010:282) says that surface dyslexics rely greatly on a process of sounding out the possible relationship between graphemes and phonemes. It was also common for the respondents to replace the target word with similar sounding English words. Even though this is a characteristic of deep dysgraphics, it was identified even as the subjects read the nonsense words. For instance, VMH read *nure* and *plaw* as *nurse* and *play* respectively, while ELM replaced *kight*, *bry*, *foon* and *tife* with *knife*, *buy*, *food* and *life* respectively. Similar replacements were common among the subjects.

2.2.2 The subjects' reading of words in context and in isolation

The subjects were asked to read lists of content words (ten polysyllabic and ten monosyllabic). Their responses are displayed in tables 3 and 5 above. The same words were presented in sentences for the subjects to read, and, their responses are displayed in tables 3 and 5. A summary of their reading (table 7) shows that, generally, words were read better when presented in context 24.4%, than when presented in isolation 21.4%. This concurred with the second hypothesis of this study which stated that, words presented in context would be read more easily than those presented in isolation. A similar view is held by other writers, (Berninger & Wolf, 2009; Shaywitz 2003) who claim that context presents an advantage to dyslexics in their reading.

This study further carried out a chi-square test to ascertain whether the difference between the subjects' reading in context and their reading in isolation was statistically significant. The result was a chi-square value of 0.95 at 1 degree of freedom and at the 5% level of significance. This result (0.95) is lower than the chi-square (X^2) critical values for 1 degree of freedom at the .05 level of significance, which are 3.84.This implies that even though the subjects read words in context better, the difference between their reading in context and their reading in isolation is not statistically significant.

This study further noted that while subjects' reading of monosyllabic words was better in context, 27.6%, than in isolation, 22.4%, the reading performance in polysyllabic words remained the same, 21.2% both in context and in isolation. None of the twenty-five subjects was able to read half (i.e. 50%) of the monosyllabic words correctly, when they were presented in isolation, while Four (i.e. 16%) subjects read at least half of the words when they were presented in context. Three (12%) read at least a half of the Polysyllabic words correctly when they were presented in context and two (8%) when presented in isolation. Six subjects could not read even a single polysyllabic word correctly when presented in context, while three failed to read any of them when presented in isolation. The word *tree* presented the least difficulty to the respondents, with 64% correct reading in isolation, and 72% correct reading in context. Likewise, the word *remember* was the best read polysyllabic word, both in isolation 64% and in context 56% . The better performance on the two words could be due to the fact that they are more frequent in the vocabulary of the respondents. This parallels what is experienced in Wernicke's aphasics whom Radford et al (1999:248-9) say that, "[their]…performance on content words is affected by the *frequency* of the word in the vocabulary: infrequent words take longer to retrieve and are more often inaccurately retrieved than frequent words." The word *knee* was the worst read by the respondents, with none managing to read it correctly in isolation and only 4% reading it correctly, in context. We note that though it is part of the body, the English word *knee* is hardly spoken by the respondents in their day-to-day conversations, making it a low-frequency word to them. The word *secretary* was the worst read polysyllabic word, with none of the subjects managing to read it correctly at all. This study notes that the word *secretary* was also a low-frequency word among the subjects of this study. In addition, we speculate that the structural complexity of the word made it problematic to the subjects because it is a four-syllable word and also contains a consonant sequence on the second syllable which gave the subjects a problem pronouncing. For example BK read it as *sectri* and *sectrali*, while HAP read *scree* and *sem* in isolation and context respectively. Whole word omission was more when the words were read in context (10 words), than when they were read in isolation (4 words).

The subjects' readings also displayed some patterns of similarities which may require future investigation as they were out of the scope of the current study. For example, while five of the subjects read the word *bite* as *bet* in isolation, none of them read it as *bet* in context; instead, four of them read it as *bit.* Two participants read the word *bite* as *bat* in isolation, and *bit* in context. These patterns do not seem to be mere coincidences. It is also worth investigating why the same word appears different to dyslexics when presented in context.

2.2.3 The subjects' reading of functional and content words

The fourth hypothesis of this study was that functional words would cause greater difficulty in reading than content words. Both the functional and the content words used to test this hypothesis were presented within the same context (eleven sentences). The subjects' responses were recorded in tables 4, 6 and 7. Contrary to the expectations of this study, the respondents read functional words better 40.8%, than they read the content words 24.4%. When this difference in reading was subjected to the chi-square test, it yielded a chi-square value of 45.62. Since the Chi-square (X^2) critical values for 1 degree of freedom at the .05 level of significance are 3.84, this study found it statistically significant that, the dyslexics performed better in functional words than content words. These results are puzzling and a challenge to the long held notion that dyslexics find more problems with functional words than content words, a position articulated by Shaywitz (1993:112) who argues that, "The small function words are so neutral that it is difficult for the dyslexic child to find something in the text to help him anchor and remember the word."

This study however noted that most of the dyslexics showed signs of agrammatism (omission of functional words in speech production). Omission of functional words was greater (7.6%) than that of content words (2%). These omissions of functional words also feature in other language disorders. Radford et al (1999:244-5) says that agrammatism is a major characteristic of Broca's aphasia. Crystal (2010:283) identifies the following errors from the responses of a deep dysgraphic patient to a single-word dictation: "Function words are particularly poor: some are not attempted; some bear little resemblance to the stimulus word." In the current study, some of the subjects' responses indeed, had little resemblance with the target words. For example a respondent, EMS, read *ndeti*, *aho*, and *bihon,* for the words *that*, *over* and *don't*, respectively, while HAP read the words *us* and *I* as *doi* and *thema* respectively. Some respondents replaced the target functional word with another functional word, which is completely dissimilar to the target word. For example HAP reads *for* as *were*, ELM reads *don't* as *my* and HMN reads *cannot* as *is*. A similar phenomenon is observed by Crystal, (2010:282), where a deep dyslexic patient writes *for* as *and*, and *in* as *those*. Of the twenty-five respondents, ten read at least half of the functional words correctly, with HMN reading all of them correctly. The best read functional word is the pronoun *I*, with 72%correct readings. Perhaps this is because the word is frequently used among the subjects. The pronoun *us* was the worst read with only 20% of the readings correct. Most of the respondents, 52% read it as *use*, which indicates that they lacked mastery of the grapheme-phoneme correspondence rules. Snowling (1981:220) says that, "[Dyslexics] may be unaware of the sound structure of spoken words and therefore unable to decipher the way in which the sound structure relates to the orthographic structure of written words." Three of the respondents could not read a single word correctly.

With content words, substitution of target words with other English words was a major tendency among the subjects. The words *fence* and *secretary* were substituted 13 times each, with a total of 10 different English words for each.

LCD for example replaced seven out of the ten monosyllabic words with other English words, while SKS substituted six out of ten polysyllabic words. Similar substitutions were discovered in 22 out of the 25 respondents. Most of the subjects were able to read the initial sounds of the words presented, but they would fill the rest of the sounds to read either a meaningless word, or an English word different from the intended word. The word *envelope* was replaced with meaningless words by 22 respondents. Shaywitz (2003:114) says that, "Making repeated substitutions is a sure sign that the reader is using context to guess at the meaning of words she has been unable to decode." The aspect of decoding was beyond the scope of this study, but a casual look at the substitutions made by the subjects reveal two things, first, that the substitutions occur almost equally both in context and in isolation, and second, that even when used in context, the substitutions do not result to any meaningful utterance. We posit that to some dyslexics, as in the majority in this study, reading and decoding are independent of each other. Omission of letters, as in *trow* for throw and *rit* for *right*; substitution, such as *light* for *right*, and interchanging of letters within words, such as *kinf* for *knife* are common mistakes committed by most of the participants. The subjects had problems with diphthongs. The sound /ai/ in bite was pronounced as /e/ five times, and as /i/nine times when read in isolation. In context, it was read as /i/ fifteen times out of twenty five. Most of the respondents read bite as bit. Ellis(1984:115)says that, surface dyslexics often fail "… to lengthen the vowel in a word which ends in e, thereby reading *bike* as 'bik' and *describe* as 'describ'" The sound /ei/in t*rain* was read in varied ways, with only six of the respondents getting it right. Most of the subjects pronounced letters which were supposed to be silent while reading. 21 respondents pronounced the /k/in *knee* and 8 respondents pronounced /k/in *knife*. I assume that most of the mistakes above are due to the failure by dyslexics to master the letter- sound relationships of the English language which, unlike the other languages the subjects are exposed to (Lulogooli and Kiswahili), lacks direct grapheme-phoneme correspondence . Liberman et al (1980) say, “A deep orthography, like that of English, demands greater phonological development on the reader’s part than a shallow orthography….’’ Shaywitz, (2003:116) further explains that, “The difficulties that a dyslexic reader has in gaining command of the phonology of his primary language are exacerbated when he tries to learn a new language.” Some respondents, for example EIC and EMS broke consonant clusters by inserting vowels. This produced meaningless words, such as *rigashditi*, *taraina* and *fenike*, read by EIC for *right*, *train* and *fence*, respectively, and *kinifu*, *fonisi* and *tirawa*, read by EMS for *knife*, *fence* and *throw* respectively. This is probably due to the influence of their first language, Lulogooli, which lacks closed syllables.

2.2.4 The subjects’ reading of monosyllabic and polysyllabic words

The subjects were asked to read monosyllabic and polysyllabic words, both in isolation and in context. Their responses are recorded in tables 3 and 4 for monosyllabic, and 5and 6 for polysyllabic words. Averagely, monosyllabic words were read better 25%, than polysyllabic words 21.2%. This concurred with our sixth hypothesis which stated that monosyllabic words would be read more easily than polysyllabic ones. The subjects recorded better reading performance when monosyllabic words were presented in a linguistic context (27.6%), than when they were presented in isolation (22.4%). However, the subjects read an equal percentage of polysyllabic words in context as in isolation. When the difference between the subjects’ reading of monosyllabic and polysyllabic words was subjected to a chi-square test, it yielded a chi-square (X^2) value of 2.02. At the .05 level of significance, with 1 degree of freedom, the chi-square value of 2.02 is statistically not significant, since it is below the chi-square critical values 3.84.

Most of the respondents produced meaningless utterances when asked to read polysyllabic words (56.8%), than they produced with monosyllabic words (34.6%). In most of the polysyllabic words, clipping or deletion of some phonemes was common. Examples of such utterances include i*ntesti* for *interesting* (SAB) *evlope* for *envelope* (HMH) *spell* for *spelling* (GMH) *sectri* for *secretary* (BK) *handwrit* for *handwriting* (VMH). The word *envelope* was replaced with meaningless words by 23participants when read in isolation. We speculate that the dyslexics found either distorted, or no forms related to the words stored in their memories, from previous encounters with the words to refer to, and an attempt to read the 'strange' word proved futile as they were overwhelmed by the length of the words and the many syllables. Shaywitz (2003:111) says that, "…part of the process of becoming a skilled reader is forming successively more detailed and complete representations of familiar words. Generally, dyslexic readers require many more exposures to a printed word over a much longer period of time before the stored representations are clear and true to the printed word. "

The respondents recorded a higher substitution of target words with known English words in monosyllabic words (42.2%) than polysyllabic words (20.4%). Most of the substitutions in monosyllabic words were due to their failure to master the letter-sound relationships of the English language, hence producing utterances such as *bit* for *bite*, *car* for *cure* and *net* for *neat*. Substitutions in polysyllabic words did not seem to have a specific pattern. Some were replaced with the more frequent word in the subjects' vocabulary, for example when reading the words in isolation, nine respondents read *engine* as *English,* six read *secretary* as *security,* and five read *handwriting* either as *hardworking* or *hard work.* Other substitutions were strange, as they did not show any relationship with the target word. For example when reading in isolation, EIJ reads *remember* as *engineer,* DAS reads *interesting* as *electricity*, LCD reads *envelope* as *people,* and while reading in context, HMN reads *vehicle* as *well*, DAS reads *secretary* as *read*, LNB reads *engine* and *remember* as *hit* and *left* respectively

CHAPTER THREE: PRESENTATION AND DISCUSSION OF THE RESULTS ON DYSGRAPHIA

3.1 Presentation of the results

This chapter presents and discusses the results produced from the writing tasks administered to the subjects. First, the results are presented in tables, and there are tables on the subjects' writing of: monosyllabic English words dictated in isolation; monosyllabic English words dictated in context; polysyllabic English words dictated in isolation; polysyllabic English words dictated in context; functional words dictated in context; and a table on the summary of the subjects' performance in the writing tasks, then, the statistical tests used to test the study's hypotheses are reported.

3.1.1 Tables of the results

The results are presented in six tables: one, on the Subjects' writing of monosyllabic English words dictated in isolation (see Table 12); two, on the subjects' writing of monosyllabic English words dictated in context (see Table 13); three, on the subjects' writing of polysyllabic English words dictated in isolation (see Table14); four, on the subjects' writing of polysyllabic English words dictated in context; (see Table 15) five, on the subjects' writing of functional words dictated in context (see Table 16) and six, the summary of the subjects' writing (see Table 17).

Table 12: The Subjects' writing of monosyllabic English words in isolation

Target word → Subjects ↓		Bite	right	train	neat	knife	knee	fence	throw	tree	Cure	Correct writings	%
1	BEF	bait	rait	c	det	naifi	ned	c	trow	c	Qua	3	30
2	BK	bait	raiti	trureni	nite	kneaf	nean	feans	troer	c	Yuwa	1	10
3	BME	bati	rati	turuni	nati	nifu	ni	fuzi	tuho	c	Rawew	1	10
4	BOT	blit	ranti	treni	neti	naiefu	nei	fenizie	torei	terr	kiewa	0	0
5	DAS	bait	rait	tureini	nit	kinf	nii	fez	tro	c	kwa	1	10
6	EIC	baiti	salti	tiriina	-	naifu	niies	fezi	turo	turiti	Kiva	0	0
7	EIJ	c	riti	trini	niti	kainfi	ini	fasi	tharo	c	Kiwa	2	20
8	EKE	c	rite	tire	intl	knef	ne	c	filow	c	Kiwa	3	30
9	ELM	brf	owote	ranbot	tiit	bliet	-	facfer	twocall	two	Crlle	0	0
10	EMS	bas	RaRti	toARni	miti	nilfi	ni	fuAzi	tiRo	mit	kIwe	0	0
11	GKA	c	rieght	tiran	c	c	hee	setim	grow	c	c	5	50
12	GMH	bito	rait	tiren	meet	knefi	nee	finsiri	tero	c	kiwa	1	10
13	HAP	BAnit i	Raniti	Rneni	nitni	naifu	nini	fenzi	zorno	terni	c	1	10
14	HMC	buyt	ruts	trayn	nit	nuyf	nir	fensir	troo	c	cur	1	10
15	HMH	baiti	raits	treini	nitis	laifu	nili	pamus	sTuro	tur	kiwa	0	0
16	HMN	bit	write	c	nit	c	c	fesh	c	c	c	6	60
17	KMV	c	c	tra	c	c	sandnce	teingze	c	c	c	7	70
18	LBN	beta	c	trein	c	knef	near	fensi	foorn	c	kiwer	3	30
19	LCD	bita	ritan	reinsg	motaing	naslus	c	fisi	tarau	tait	qwam	1	10
20	LIA	bete	reet	trein	nent	neef	nee	fens	tro	c	qwe	1	10
21	LNB	bati	write	tan	neeait	c	ni	ferizi	nairo	c	can	2	20
22	LSB	c	write	tain	c	c	ninia	fenca	thorw	c	kiwa	4	40
23	SAB	c	wirta	tian	mete	kinfe	hate	fazi	sigota	c	clan	2	20
24	SKS	c	c	trne	knet	kinfe	c	face	tore	c	c	5	50
25	VMH	biti	rahiti	c	c	knief	c	c	trow	c	cur	5	50
Total of correct writings		7	3	3	5	5	4	3	2	18	5	55	
%		28	12	12	20	20	16	12	8	72	20		22

Table 13: The subjects' writing of monosyllabic English words in context

Target word → Subjects ↓		Bite	right	train	neat	knife	knee	fence	throw	tree	cure	Correct writings	%
1	BEF	biet	-	trein	-	naif	c	c	trow	c	kua	3	30
2	BK	bati	rati	c	net	knaf	nie	feac	trow	c	-	2	20
3	BME	-	rait	tecken	-	nifu	mimi	sfizi	tu	c	-	1	10
4	BOT	byteiga	reti	tern	neti	neifu	neini	ficnes	tro	trre	qiwa	0	0
5	DAS	bat	rati	tureni	mil	karus	mani	fizi	for	c	kua	1	10
6	EIC	bait	rati	teni	eiti	-	inrch	fezi	turo	tiri	cua	0	0
7	EIJ	baeti	wriet	trini	c	knifi	ni	fasi	town	c	kikiawa	2	20
8	EKE	bati	riti	reini	niti	naifi	nti	inz	tolo	c	kiwa	1	10
9	ELM	badt	ras	rspabott	eiit	kife	mimi	faires	to	c	cur	1	10
10	EMS	-	-	-	thee	nafi	thee	finsi	toro	thee	-	0	0
11	GKA	bank	rieght	tiran	-	knief	mke	kive	c	c	kivo	2	20
12	GMH	bet	-	trun	-	knefi	net	fise	tero	c	kiwa	1	10
13	HAP	ganit	rati	-	-	naifu	ni	fezi	zno	rni	-	0	0
14	HMC	bay	rat	tring	mits	ntayf	mi	tece	-	c	-	1	10
15	HMH	baiti	raiti	-	-	naifu	-	feri	tuoro	tur	-	0	0
16	HMN	by	write	-	nut	c	new	fece	trow	c	adeg	2	20
17	KMV	c	-	c	nata	c	-	farce	c	c	-	5	50
18	LBN	c	writing	tain	c	knef	near	c	c	c	kiwer	5	50
19	LCD	-	ritam	tasi	-	-	-	si	thoe	tasus	qlikwa	0	0
20	LIA	by	-	trein	net	neif	nent	fens	troo	c	qua	1	10
21	LNB	bati	write	tirani	neti	nafi	nia	fesi	lewo	c	-	1	10
22	LSB	c	write	trian	c	c	nia	feca	thorw	c	quwa	4	40
23	SAB	c	c	c	nate	kinfe	-	heze	ta	c	c	5	50
24	SKS	c	c	trne	knet	kinfe	c	face	tore	c	c	5	50
25	VMH	haitig	-	c	-	c	neae	c	trow	c	knee	4	40
Total of correct writings		5	2	4	3	4	2	3	3	19	2	47	
		20	8	16	12	16	8	12	12	76	8		18.8

Table 14: The subjects' writing of dictated polysyllabic English words in isolation

Target word → Subjects ↓		handkerchief	handwriting	Reme-mber	engine	vehicle	secretary	spelling	envelope	environment	interesting	Correct writings	%
1	BEF	handkechif	handraiting	c	higine	vyeco	setritary	speling	envelop	envoroment	intresing	1	10
2	BK	handkachifu	hadiraitingi	rimemba	ingine	veako	sekitirari	sepeling	avelop	avoerometi	intesiting	0	0
3	BME	hadkichifu	haduralini	ramamba	nigni	vieko	sersentari	sipelini	heveli	evorometi	etuclusens	0	0
4	BOT	c	handratien	rimerimder	incgieni	veiyecil	secritari	spilnge	nvropier	niverometi	intresimu	1	10
5	DAS	adkachifu	hadlatini	rimemba	higini	veko	setri	splin	evlop	enromet	insting	0	0
6	EIC	hanikachifu	habisaitini	rimeba	ijinni	vieko	sekitari	sipeini	evopu	inivaromemiti	iteretini	0	0
7	EIJ	hadikchif	handwirting	ribab	echini	vekeko	sekrtari	spleni	envalop	envalomati	edrsni	0	0
8	EKE	andakacff	haitriti	remaba	ijni	viAeco	siurtari	spipiska	navelaope	aniveliRmda	intresti	0	0
9	ELM	haefrenf	wtre	eronil	echnnet	cll	saedoreutio	cpellho	afraekow	oefmtecog	etwoac	0	0
10	EMS	anofu	abRtina	rimeb	iineRa	viAta	suchaRi	siperina	AdoDo	efiRomeb	itorisini	0	0
11	GKA	handcheif	handwrite	remeber	enjeme	vehicin	setare	spellin	enevlope	enovernment	Interne	0	0
12	GMH	handkachif	harait	c	egin	figo	seceretry	sparn	epor	enfaromet	Entenc	1	10
13	HAP	nAhichifu	adiRaetini	rimebnu	njini	veco	seciritori	sipoelnghe	enevelopu	enivairometi	enisetini	0	0
14	HMC	hundcrchef	handraitin	remembur	hejin	vyecor	sacritorri	speling	enmelormp	Envarromend	etrestin	0	0
15	HMH	AnDikachifu	adiraetini	rememba	injini	veko	sikretare	speli	enivelopu	enivairomenti	insitisitivu	0	0
16	HMN	c	c	c	c	c	serttary	spellng	evvelope	envaroments	estirestine	5	50
17	KMV	handkercheif	handwiring	c	engend	envey	secenity	vemetare	evenlety	everinemeter	Intescenaty	1	10

18	LBN	handkeathirf	c	c	enjinig	vihecle	serrcretery	c	envelop	evarlomet	etrersting	3	30
19	LCD	habcheif	habbi	conaud	ijina	viko	sitaRi	siping	evio	evimta	Etama	0	0
20	LIA	endcechief	endrehiting	rember	ingin	vecos	secriter	spening	entelopho	enveromint	enronit	0	0
21	LNB	handnechief	handwrite	rebar	enging	vehirige	sitiri	siburni	onepio	oinventi	insenig	0	0
22	LSB	handchief	handwrite	remeber	enging	vechile	secritry	speeling	englovp	enroviment	inierstaing	0	0
23	SAB	handkicefeh	handwirtapi	rememba	inimeri	veline	seketare	seperi	engvepu	einguita	inirtenn	0	0
24	SKS	handkechif	handwiting	c	c	vicoer	secrtrer	c	invelope	invroement	inseting	3	30
25	VMH	handkachifi	handwititi	rember	eigen	vicho	seciritry	spellllng	evelope	eniveiroment	instomi	0	0
Total of correct writings		2	2	6	2	1	0	2	0	0	0	15	
%		8	8	24	8	4	0	8	0	0	0		6

Table 15:The subjects' writing of dictated polysyllabic English words in context

Target word → Subjects ↓		handkerchief	handwriting	Reme-mber	engine	vehicle	secretary	spelling	envelope	environment	interesting	Correct writings	%
1	BEF	hendkerfe	hendraiting	c	higine	vyeco	cakritery	speling	c	inveiroment	intresing	2	20
2	BK	handkachifu	handaratinge	remamBa	higine	veko	socitari	spelingi	enivaropu	anvairomet	intreting	0	0
3	BME	hadlachifu	hadiritkine	remba	ingini	vaco	castutngri	sepili	eovilipo	eoverommeti	-	0	0
4	BOT	c	hardretigi	rermebar	iengine	vecoli	setier	sori	ivellpoe	inveromete	intestivi	1	10
5	DAS	akachefu	adiladini	remmeber	igini	vako	sitire	rebeni	lool	-	asitires	0	0
6	EIC	akchifu	haburiel	rimeba	iJini	viko	sekitrl	sipelin	thepo	everomen	ibtstsi	0	0
7	EIJ	hadikachaif	handwireting	rimebb	echini	veorko	setiri	sipalani	envpali	envpalo	entrshni	0	0
8	EKE	hakachf	arte	rimaba	eijin	vica	siretari	sipi	antlopu	virometi	dawati	0	0
9	ELM	chafefar	write	-	chero	vehoer	satre	cpalbo	ataoppe	-	intowtrac	0	0
10	EMS	ayiri	abritam	rimep	ichini	vIApo	ski	siperi	ninviApo	ntiRome	lisitorisi	0	0
11	GKA	headkerchief	handwrite	rember	enjam	vehicin	searein	-	enjone	enevonment	interne	0	0
12	GMH	handkachif	handrei	remembr	iene	fica	secory	sibili	efiopu	-	-	0	0
13	HAP	agachu	aduraitigi	rimeda	egni	veco	secritari	sipe	aniveti	vometi	nitritemo	0	0
14	HMC	andkachif	andratin	rimembar	ingia	vyeko	secRitari	speling	-	envaromend	-	0	0
15	HMH	andikachifu	andiraitint	rememba	ini	veco	selritare	speli	adlipo	laturenl	iterf	0	0
16	HMN	handkercheif	c	c	c	c	cecutary	spellng	envarope	inverome	interent	4	40
17	KMV	hadkechieif	hadwiring	c	eveng	vecede	sercetey	simbe	enecarteny	inven	-	1	10

18	LBN	hadkenchef	c	c	c	vihecle	secrerry	c	everlop	inverloment	intresting	4	40
19	LCD	habakachaif	hadeing	rimaba	ijina	vioco	satar	sali	evmicopo	evmaita	etasimu	0	0
20	LIA	endchechif	andreiteng	member	engin	vecos	scteri	speling	etaloph	evarment	-	0	0
21	LNB	handcarfi	hand	rebe	enige	vehilce	siritri	-	engbo	inermet	asese	0	0
22	LSB	handchief	handwrite	c	enging	vehilce	secritry	speeling	englovep	ernvomet	inistaring	1	10
23	SAB	handkichafe	wriiting	wememberi	egane	veching	setre	beri	envoing	-	intersting	0	0
24	SKS	handkechife	handrwititing	remembe	enger	viecoer	secatire	c	eavope	invirment	insatring	1	10
25	VMH	handkachifi	handwrote	rember	ejine	vechi	secutaryl	c	eelope	evorment	soreing	1	10
Total of correct writings		1	2	5	2	1	0	3	1	0	0	15	
%		4	8	20	8	4	0	12	4	0	0		6

Table 16: The subjects’ writing of functional words dictated in context

Target word → Subjects ↓		cannot	that	over	an	us	very	don’t	there	for	I	Correct writings	%
1	BEF	c	c	c	c	has	c	c	c	c	c	9	90
2	BK	kromnot	c	ove	c	as	ver	dot	bear	fo	c	3	30
3	BME	conenot	thet	oves	are	a	c	dot	the	-	Hi	1	10
4	BOT	kaknot	thata	c	a	as	veri	donot	rewa	c	c	3	30
5	DAS	kananoto	c	for	-	las	-	Dod	the	c	c	3	30
6	EIC	canot	bat	-	a	-	vero	boti	the	c	-	1	10
7	EIJ	kanoti	c	fova	ni	hus	c	dot	the	fur	c	3	30
8	EKE	canti	tha	lolvi	-	-	-	doti	the	-	A	0	0
9	ELM	not	c	of	a	has	vetr	dolt	the	fort	c	2	20
10	EMS	kano	-	of		-	-	ba	-	form	-	0	0
11	GKA	c	the	c	-	-	c	does	their	-	c	4	40
12	GMH	c	c	ovary	ni	-	every	did	c	c	c	5	50
13	HAP	conoti	c	-	ati	doti	c	-	-	wnw	zemu	2	20
14	HMC	kanot	c	wesec	-	c	-	-	-	wi	the	2	20
15	HMH	not	c	hos	dati	doti	Ai	mai	-	we	themu	1	10
16	HMN	kan	c	c	-	c	a	-	a	c	-	4	40
17	KMV	dont	the	c	a	-	-	c	the	of	-	2	20

18	LBN	connot	c	c	-	as	c	do’nt	their	c	c	5	50
19	LCD	tnot	-	c	-	-	-	dat	the	fi	-	1	10
20	LIA	-	c	-	-	as	-	dot	thea	fo	a	1	10
21	LNB	keti	c	one	-	-	-	not	ther	-	a	1	10
22	LSB	c	c	c	-	c	c	c	their	c	c	8	80
23	SAB	comenot	the	on	a	ares	-	dot	the	c	As	1	10
24	SKS	not	c	c	a	has	-	did’t	c	c	c	5	50
25	VMH	c	c	in	-	-	-	c	theya	c	c	5	50
Total of correct writings		5	16	9	2	3	7	4	3	11	12	72	
%		20	64	36	8	12	28	16	12	44	48		28.8

Table17: Summary of the subjects’ writing

	in isolation	in context	Total	%
Monosyllabic	22	18.8	40.8	20.4
Polysyllabic	6	6	12	6
Total	28	24.8	52.8	
%	14	12.4		13.2

3.1.2 Statistical tests related to dysgraphia

The layout of the statistics used in this study and the interpretation of the results follow the critical values approach.

The study's third hypothesis said that words presented in context would be written more easily than those presented in isolation. Its chi-square test is done below:

Table 18: Frequency of correct spelling of words in isolation versus words in context

	Yes		No		Total
	fo	*fe*	*fo*	*fe*	
Words dictated in isolation	70	(66)	430	(434)	500*
Words dictated in context	62	(66)	438	(434)	500*
Total	132**		868**		Grand total 1000

$$X^2 = \Sigma \left[\frac{(fo - fe)^2}{fe} \right]$$

$$= \frac{(70 - 66)^2}{66} + \frac{(430 - 434)^2}{434} + \frac{(62 - 66)^2}{66} + \frac{(438 - 434)^2}{434}$$

$$= \frac{16}{66} + \frac{16}{434} + \frac{16}{66} + \frac{16}{434}$$

$$= 0.24 + 0.04 + 0.24 + 0.04$$

$$X^2 = 0.56$$

Degrees of freedom = (rows -1) (columns -1)

= (2-1) (2-1)

=1

The study's fifth hypothesis said that functional words would cause greater difficulty in writing than content words. Below is the chi-square test for this hypothesis.

Table 19: Frequency of correct spelling of functional words and content words

	Yes		No		Total
	fo	*fe*	*fo*	*fe*	
Functional	72	(44.7)	178	(205.3)	250*
Content	62	(89.3)	438	(410.7)	500*
Total	134**		616**		Grand total 750

$$X^2 = \Sigma \left[\frac{(fo - fe)^2}{fe} \right]$$

$$= \frac{(72 - 44.7)^2}{44.7} + \frac{(178 - 205.3)^2}{205.3} + \frac{(62 - 89.3)^2}{89.3} + \frac{(438-410.7)^2}{410.7}$$

$$= \frac{745.29}{44.7} + \frac{745.29}{205.3} + \frac{745.29}{89.3} + \frac{745.29}{410.7}$$

$$= 16.67 + 3.63 + 8.35 + 1.81$$

$$X^2 = 30.46$$

Degrees of freedom = (rows -1) (columns -1)

= (2-1) (2-1)

=1

The study's seventh hypothesis was that monosyllabic words would be written more easily than polysyllabic ones. Below is the chi-square test for this hypothesis.

Table 20: Frequency of correct spelling of monosyllabic words and polysyllabic words

	Yes		No		Total
	fo	*fe*	*fo*	*fe*	
Monosyllabic	102	(66)	398	(434)	500*
Polysyllabic	30	(66)	470	(434)	500*
Total	132**		868**		Grand total 1000

$$X^2 = \Sigma \left[\frac{(fo - fe)^2}{fe} \right]$$

$$= \frac{(102 - 66)^2}{66} + \frac{(398 - 434)^2}{434} + \frac{(30 - 66)^2}{66} + \frac{(470 - 434)^2}{434}$$

$$= \frac{1296}{66} + \frac{1296}{434} + \frac{1296}{66} + \frac{1296}{434}$$

$$= 19.63 + 2.99 + 19.63 + 2.99$$

$$X^2 = 45.24$$

Degrees of freedom = (rows -1) (columns -1)

= (2-1) (2-1)

=1

3.2 Discussion of the results

Most of the respondents displayed signs of dyslexic dysgraphia, phonological dysgraphia and visual dysgraphia.

3.2.1 The subjects' writing of words in context and in isolation

The third hypothesis was that words presented in context would be written more easily than those presented in isolation. Tables 12 and 14 contain the subjects' writing of words dictated in isolation while tables 13 and 15 contain their writing of words dictated in context. The summary in table 17 above indicates that contrary to the third hypothesis, on average, words dictated in isolation were written better 14%, than words dictated in context 12.4%. However, the subjects' writing of polysyllabic words remained the same, at 6%, both in context and in isolation. The difference between writing in isolation and writing in context was subjected to a statistical test and yielded a chi-square (X^2) value of 0.56. This means that the difference between the subjects' writing in isolation and writing in context was not statistically significant, because the chi-square value of 0.56 is below the chi-square (X^2) critical values for 1 degree of freedom at the .05 level of significance, which are 3.84.

It was further noted that the subjects recorded more omissions when writing words dictated in context 9.6% than those dictated in isolation 0.4%. All the subjects had the problem of writing different spellings for the same word when dictated in context and when dictated in isolation. For example, BOT writes *rermebar*, *vecoli*, *sori* and *intestivi* for *remember vehicle*, *spelling* and *interesting* respectively when dictated in context, but when dictated in isolation he writes them as *rimerimder*, *veiyecil*, *spilnge* and *intresimu.* This means that they do not have specific forms of the words in their memory to retrieve, but just try to guess the possible combinations of letters that can represent the sound heard. Such failure to decipher the relationship between sounds and letters of words has been identified by different writers also as common among dyslexics (Snowling 1981, Crystal 2010, Shaywitz 2003). It is also similar to what this study found out in the subjects' reading, that they try to guess at possible sounds that can represent the words they read hence they and up with distorted forms. None of the subjects could write the words *secretary*, *environment*, and *interesting* correctly, whether in isolation or in context.

3.2.2 The subjects' writing of functional and content words

The sixth hypothesis was that Functional words would cause greater difficulty in writing than content words. The content words included ten monosyllabic and ten polysyllabic words, and they were dictated to the respondents within the same sentences as the functional words. Table 16 represents the subjects' writings of functional words, while their responses to content words are recorded in tables 13 and 15. The subjects wrote functional words better 28.8% than the average writing of content words 12.4%. This was contrary to what this study had hypothesized, and also contradiction of (Crystal, 2010: 283) who claimed that dysgraphics, especially deep dysgraphics, have a problem with functional words. These results were subjected to a statistical test, and they yielded a chi-square (X^2) value of 30.46, implying that the better performance in functional words as opposed to content words was statistically significant, since30.46 is higher than the chi-square (X^2) critical values for 1 degree of freedom at the .05 level of significance which are 3.84.

Further analysis revealed that there were more omissions of functional words, 21.2% of the responses, than content words 9.6%. This is also a common feature of other disorders such as deep dysgraphia and Broca's aphasia (Crystal, 2010:283, Radford et al 1999:244-5). The best written content word was the word *tree* at 76% in context and 72%in isolation, while the best written functional word was the demonstrative *that* at, 64%. Six out of the twenty-five participants wrote at least half the functional words correctly, but two of the participants (EKE and EMS) could not write any of the functional words correctly. The mistakes made by HAP and HMH showed some strange similarities, that did not appear to be mere coincidence. Both wrote the pronoun *us* as *doti*. HAP wrote *zemu*, *wnw* and *ati*, for *I*, *for* and *an* respectively, while HMH wrote the same words as *themu*, *we* and *dati*. A part from the fact that the responses have no similarity with the target word, they display a phonological similarities, which this study speculated could be due to a similar auditory impairment. Some of the subjects' writings bore little resemblance to the expected words. For example, ELM wrote *eronil*, *echnet* and *etwoac* for *remember*, *engine* and *interesting* respectively. Most of the subjects mixed lower case and upper case letters, not adhering to capitalization rules. EMS wrote words such as *vIApo* for *vehicle*, *ntiRome* for *environment* while BK wrote *remember* as *remamBa*. Santina, (2010:1) recognizes the features above as common among dysgraphics. She says that, "Dysgraphia students who have a specific disability in writing often lack basic spelling skills. They may often confuse the letters: b, q, p, and d. These students will often write the wrong words when attempting to put their thoughts down on paper, as well. A teacher may notice that the student's letters are inappropriately spaced, are incomplete or are a mixture of upper and lower case letters all in the same word."

Rasheed, (2013: 41) says that, people with phonological dysgraphia"…are unable to remember phonemes and mix them appropriately to produce the desired result. Normally this results in writing and spelling irregularities. " this was evident among most of the subjects, as they failed to write the words *cure*, *knee* and *train* correctly. Many respondents, that is, 40%wrote 'k' as the first letter of the word *cure*, when presented in isolation and 32% when presented in context. The letter 'i' in the word right was written either as 'a' or as 'ai' by 36% of the respondents, and only four out of fifty, that is 8% of the responses on the silent letter 'k' in the word 'knee' were correct.

3.2.3 The subjects' writing of monosyllabic and polysyllabic words

The seventh hypothesis was that monosyllabic words would be written more easily than polysyllabic ones. The subjects wrote down words and sentences dictated to them. The results were transcribed and are presented in tables12 and 14for the words dictated in isolation and 13 and 15 for those dictated in context. The summary table 17 indicates that dictated monosyllabic words were written better 20.4% than polysyllabic words 6%, which confirmed the hypothesis. When the results were subjected to a statistical test, they yielded a chi-square (X^2) value of 45.24. compared to the chi-square (X^2) critical values for 1 degree of freedom at the .05 level of significance which are 3.84, it is evident that the better performance in monosyllabic words as opposed to polysyllabic is statistically significant. These findings agree with Miceli & Capasso, (2006:120) who say that, "...error rate will be influenced by stimulus length, since reduced buffer capacity (either because fewer graphemes than normal are maintained active or because the normal number of graphemes remains active for a pathologically short time) will result in longer words being spelled less accurately than short words."

This study noted that most of the errors committed in writing were similar to those committed in reading. The subjects made several substitutions of the target words with other English words when writing dictated monosyllabic words, 10.6%, but no substitutions were done when writing polysyllabic words. In polysyllabic words, the forms written showed a failed attempt to approximate to the target word, as some phonological similarities could be identified between the two. Some of the substitutions in monosyllabic words also had phonological similarities with the target words, for example, BEF, VMH, HMN and BK wrote *trow* for *throw* &GKA wrote it as *grow*, GMH wrote *meet* for *neat* SKS wrote *face* for *fence*, which suggests an attempt to memorize the grapheme-phoneme relationship, but having a distorted form in memory. A similar feature is also noted by (Shaywitz, 2003:111) as common among dyslexics. Other substitutions, however, were outright deviations from the target words, for example, VMH writes *knee* for *cure*, DAS writes *for* for *throw*, and GKA writes *bank* for *bite.* An aspect of cross linguistic interference is exemplified by some of the errors, for example, EMS writes *mit* for *tree,* a form which resembles the Kiswahili equivalent of tree, *mti*. In polysyllabic words, most of the respondents wrote the first syllable of the target word, but failed to write the subsequent syllables correctly. This implies that as they heard the word dictated to them, their short term memory could not retain the whole word, but kept the first syllable, and their attempt to fill in the remaining syllable as they wrote produced distorted words. A similar reason accounted for the distortions of the words while reading, and (Shaywitz 2003) notes "… dyslexic readers require many more exposures to a printed word over a much longer period of time before the stored representations are clear and true to the printed word." Since in language acquisition, reading is supposed to precede writing, this study posits that the distorted forms stored in the mind at the reading stage eventually influence the forms produced in writing. Miceli &Capasso, (2006:110) assert that, "To mention the obvious, individuals learn to speak before they learn to write, and even the most prolific writer engages in speaking much more often than he or she does in spelling."

The subjects' reading and writing disabilities

The first hypothesis sought to test whether there was any correlation between the reading and writing disabilities among the subjects. A summary of each subject's correct readings of monosyllabic and polysyllabic words, both in context and in isolation, and of functional words was computed. A similar computation was done of their correct writings, and the resulting totals were used to calculate the correlation. To test this correlation, this study carried out a Pearson's product-moment coefficient (r)

Table 21: Summary of the subjects' correct readings (X)

	monosyllabic		polysyllabic		functional	Total
subjects	in isolation	in context	in isolation	in context		
1	2	3	3	3	9	20
2	4	5	2	3	6	20
3	4	2	3	2	2	13
4	2	2	2	5	2	13
5	1	0	1	1	2	5
6	0	0	0	0	1	1
7	2	3	1	1	1	8
8	2	4	1	1	1	9
9	3	2	0	0	5	10
10	1	1	0	0	1	3
11	3	3	4	3	7	20
12	1	2	4	3	3	13
13	0	1	1	0	0	2
14	4	3	2	4	6	19
15	1	1	1	1	4	8
16	4	6	5	5	10	30
17	3	2	1	1	0	7
18	3	5	2	3	9	22
19	0	0	2	0	3	5
20	2	2	3	2	5	14
21	2	4	1	0	4	11
22	3	4	5	6	7	25
23	4	3	3	3	0	13
24	4	7	3	3	9	26
25	4	4	3	3	3	20
Total	56	69	53	53	102	333

Table 22: Summary of the subjects' correct writings (Y)

	monosyllabic		polysyllabic		functional	Total
subjects	in isolation	in context	in isolation	in context		
1	3	3	1	2	9	18
2	1	2	0	0	3	6
3	1	1	0	0	1	3
4	0	0	1	1	3	5
5	1	1	0	0	3	5
6	0	0	0	0	1	1
7	2	2	0	0	3	7
8	3	1	0	0	0	4
9	0	1	0	0	2	3
10	0	0	0	0	0	0
11	5	2	0	0	4	11
12	1	1	1	0	5	8
13	1	0	0	0	2	3
14	1	1	0	0	2	4
15	0	0	0	0	1	1
16	6	2	5	4	4	21
17	7	5	1	1	2	16
18	3	5	3	4	5	20
19	1	0	0	0	1	2
20	1	1	0	0	1	3
21	2	1	0	0	1	4
22	4	4	0	1	8	17
23	2	5	0	0	1	8
24	5	5	3	1	5	19
25	5	4	0	1	5	15
Total	55	47	15	15	72	204

Table 23: Calculation of the correlation coefficient(*r*)

Subjects	X	Y	X^2	Y^2	XY
1	20	18	400	324	360
2	20	6	400	36	120
3	13	3	169	9	39
4	13	5	169	25	65
5	5	5	25	25	25
6	1	1	1	1	1
7	8	7	64	49	56
8	9	4	81	16	36
9	10	3	100	9	30
10	3	0	9	0	0
11	20	11	400	121	220
12	13	8	169	64	104
13	2	3	4	9	6
14	19	4	361	16	76
15	8	1	64	1	8
16	30	21	900	441	630
17	7	6	49	36	42
18	22	20	484	400	440
19	5	2	25	4	10
20	14	3	196	9	42
21	11	4	121	16	44
22	25	17	625	289	425
23	13	8	169	64	104
24	26	19	676	361	494
25	17	15	289	225	255
	$\Sigma X = 333$	$\Sigma Y = 204$	$\Sigma X^2 = 5950$	$\Sigma Y^2 = 2550$	$\Sigma XY = 3632$

$$r = \frac{25(3632) - (333)(204)}{\sqrt{25(5950)} - (333)^2 \sqrt{25(2550)} - (204)^2}$$

$$r = \frac{90800 - 6792}{\sqrt{148750 - 110889} \quad \sqrt{63750 - 41616}} = \frac{22868}{\sqrt{37861} \quad \sqrt{22134}}$$

$$r = \frac{22868}{(194.58)\ (148.77)}$$

$$r = 0.79$$

N= the number of participants

Degrees of freedom =N-2 =25-2

=23

At 23 degrees of freedom and at the 0.1 level, a coefficient of correlation (*r*) of 0.79 is confirmed, since it exceeds the *r* critical value of 0.505.(see Appendix V)

CHAPTER FOUR: CONCLUSION

This study sought to investigate the nature and extent of reading impairment (dyslexia) and writing impairment (dysgraphia) in the English of the upper-primary pupils in the Sabatia sub-county of the Vihiga County of Kenya. This study was conducted on twenty-five pupils from nine public primary schools. They had been identified by their teachers as having both reading and writing abilities far below their level of study. So, the present study assumed they represented symptoms of dyslexia and dysgraphia. The study sought to test the following seven hypotheses: first, there would be a positive correlation between the subjects' reading and writing; second, words presented in context would be read more easily than those presented in isolation; third, words presented in context would be written more easily than those presented in isolation; fourth, functional words would cause greater difficulty in reading than content words; fifth, functional words would cause greater difficulty in writing than content words; sixth, monosyllabic words would be read more easily than polysyllabic words; and seventh, monosyllabic words would be written more easily than polysyllabic ones. The subjects read aloud selected words and sentences in a list, as their readings were recorded using a voice recorder. For dysgraphia, the words and sentences were dictated to them. The subjects' reading and writing production was transcribed, tabulated and analyzed using both percentages and tests for statistical significance.

With regard to the first hypothesis, the Pearson's product-moment coefficient (r) was high (r = 0.79 at $p<0.01$ with df =23). This was a high positive correlation, which confirmed the hypothesis. The second hypothesis of the study was not confirmed even though the words presented in context were read better (at a rate of 24.4%) than those presented in isolation (21.4%), as had been hypothesized. A chi-square test produced a $X^{2}=$ 0.95 at $p<0.05$ with df=1, which means that even though the subjects read words in context better, the difference between their reading of words in context and their reading of those in isolation was not statistically significant. It is also important to note that 24.4% and 21.4% are a very low rate of reading ability, since this means that the subjects could not read even a quarter of the words correctly. The third hypothesis was that words presented in context would be written more easily than those presented in isolation. This hypothesis was not confirmed either. Words dictated in isolation were written better (14%), than words dictated in context (12.4%), though the difference (X^2=0.56 at $p<0.05$ with *df* =1) was not statistically significant. Hypothesis 4 and 5, both about functional words versus content words, were not confirmed either. The subjects read functional words better (40.8%) than they read the content words (24.4%) and wrote functional words better (28.8%) than content words (12.4%). This better performance on functional words was proved to be statistically significant with X^2 =45.62 at $p<0.05$ with *df* =1 for the reading tasks and X^2 =30.46 at $p<0.05$ with *df* =1 for the writing tasks. The sixth hypothesis, which stated that monosyllabic words would be read more easily than polysyllabic ones, was not confirmed, even though on average monosyllabic words were read better (25%) than polysyllabic ones (21.2%). The value of the calculated X^2 =2.02 at $p<0.05$ with *df* =1 was statistically not significant since it was below the chi-square critical value of 3.84. The seventh hypothesis was confirmed. Monosyllabic words were written better (20.4%) than polysyllabic words (6%), with the chi-square value X^2 =45.24 at $p<0.05$ with *df* =1. In general, it transpires form this study that the performance of the subjects on both the reading and writing tasks was very low, since they scored below half of the 50% mark in all the tasks, despite the fact that the tasks administered to them were (according to the syllabus) meant for class two pupils, at least two classes below the level of the subjects.

The present study looked at the number of syllables, linguistic context, and function of the words (i.e. either functional or content words) as variables. These were mainly linguistic variables. I recommend future research on the language disorders based on social variables such as gender (i.e. to find out whether the writing and reading disorders are more prevalent in one gender than the other), geographical location (i.e. extending the study to other parts of Kenya), having age as a variable (i.e. to investigate whether the effects of the reading and writing disorders are reduced as the subjects advance in age). Contrary to the expectations of this study, the reading and writing of functional words was better than that of content words. I recommend another research on the same topic to ascertain the underlying factors that influenced the result. I suggest that the types of dyslexia and dysgraphia be included in such a research as variables, since Crystal (2010: 283) seems to suggest that only deep dysgraphics have a problem with functional words.

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APPENDICES

APPENDIX I

Reading/ writing list for monosyllabic and polysyllabic content words

1) Handkerchief
2) Bite
3) Handwriting
4) Right
5) Remember
6) Train
7) Engine
8) Neat
9) Vehicle
10) Knife
11) Secretary
12) Knee
13) Spelling
14) Fence
15) Envelope
16) Throw
17) Environment
18) Tree
19) Interesting
20) Cure

APPENDIX II

Reading/ writing list for functional and content words in context

1) The train has a big engine.
2) I cannot cut a tree with a knife.
3) The secretary has a good handwriting.
4) Throw that ball over the fence.
5) Did you put the letter in an envelope?
6) We pick rubbish to keep the environment neat.
7) The story she told us was very interesting.
8) I don't remember the spelling of the word handkerchief.
9) Is there cure for a snake bite?
10) Tom left the envelope in the vehicle.
11) I hurt my right knee.

APPENDIX III

Reading list for nonsense words

1) Deat
2) Kight
3) Bry
4) Nure
5) Pake
6) Gare
7) Bave
8) Foon
9) Plaw
10) Tife

APPENDIX IV[7]

Abridged table of critical values for chi square

Abridged Table of Critical Values for Chi Square

df	Level of significance .05	.01
1	3.84	6.64
2	5.99	9.21
3	7.82	11.34
4	9.49	13.28
5	11.07	15.09
6	12.59	16.81
7	14.07	18.48
8	15.51	20.09
9	16.92	21.67
10	18.31	23.21
11	19.68	24.72
12	21.03	26.22
13	22.36	27.69
14	23.68	29.14
15	25.00	30.58
16	26.30	32.00
17	27.59	33.41
18	28.87	34.80
19	30.14	36.19
20	31.41	37.57
21	32.67	38.93
22	33.92	40.29
23	35.17	41.64
24	36.42	42.98
25	37.65	44.31
26	38.88	45.64
27	40.11	46.96
28	41.34	48.28
29	42.56	49.59
30	43.77	50.89

[7] This table was got from Best and Kahn (2006:484)

APPENDIX V[8] Critical Values for Pearson's Product -Moment correlation

Critical Values for Pearson's Product-Moment Correlation (r)

n	α = .10	α = .05	α = .02	α = .01	*df*
3	.988	.997	.9995	.9999	1
4	.900	.950	.980	.990	2
5	.805	.878	.934	.959	3
6	.729	.811	.882	.917	4
7	.669	.754	.833	.874	5
8	.622	.707	.789	.834	6
9	.582	.666	.750	.798	7
10	.549	.632	.716	.765	8
11	.521	.602	.685	.735	9
12	.497	.576	.658	.708	10
13	.476	.553	.634	.684	11
14	.458	.532	.612	.661	12
15	.441	.514	.592	.641	13
16	.426	.497	.574	.623	14
17	.412	.482	.558	.606	15
18	.400	.468	.542	.590	16
19	.389	.456	.528	.575	17
20	.378	.444	.516	.561	18
21	.369	.433	.503	.549	19
22	.360	.423	.492	.537	20
23	.352	.413	.482	.526	21
24	.344	.404	.472	.515	22
25	.337	.396	.462	.505	23
26	.330	.388	.453	.496	24
27	.323	.381	.445	.487	25
28	.317	.374	.437	.479	26
29	.311	.367	.430	.471	27
30	.306	.361	.423	.463	28
35	.282	.333	.391	.428	33
40	.264	.312	.366	.402	38
50	.235	.276	.328	.361	48
60	.214	.254	.300	.330	58
70	.198	.235	.277	.305	68
80	.185	.220	.260	.286	78
90	.174	.208	.245	.270	88
100	.165	.196	.232	.256	98
200	.117	.139	.164	.182	198
500	.074	.088	.104	.115	498
1,000	.052	.062	.074	.081	998
10,000	.0164	.0196	.0233	.0258	9,998

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[8] This table was got from Best and Kahn (2006:482)