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DYSLEXIA AND DYSGRAPHIA IN THE READING AND WRITING OF ENGLISH WORDS BY UPPER-PRIMARY PUPILS FROM SELECT SCHOOLS IN SABATIA SUB-COUNTY IN KENYA

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This study sought to investigate whether there was correlation between reading impairment (dyslexia) and writing impairment (dysgraphia), and whether function words would pose a greater challenge than content words in both reading and writing in the English of a group of twenty-five upper-primary pupils (of the Sabatia Sub-county of Vihiga County, Kenya) who experienced serious reading and writing difficulties. It found that there was a high positive correlation between the subjects' reading and writing (r = 0.79 at $p<0.01$, with df =23). However, contrary to what had been hypothesized (based on the available literature on language disorders), it found that the subjects' performance on both reading and writing function words was significantly better than that on reading and writing content words (with calculated chi-square values of 45.62 for reading and of 30.46 for writing). Overall, the study's results show that when the target words were presented in a list (i.e. in isolation), there was no statistical difference in the subjects' performance on reading and that on writing, but when they were presented in sentences (i.e. in context), the subjects did significantly better on reading than on writing, both for content and function words. However, in absolute terms they did poorly on both reading and writing, well below a 50% correct-reading and correct-spelling rate.

1. INTRODUCTION

The focus of the present study is the "*developmental* kinds of dyslexia and dysgraphia that occur in young children where there is no evidence of any brain damage" (Crystal 2011, p. 282), as opposed to the *acquired* kinds which result from a damage to the brain due to an illness or an injury. With regard to dyslexia, the present study will therefore be guided by the

following definition, from Crystal (2010: 283), referring to dyslexic children: "[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." Regarding developmental dysgraphia, the study will be guided by the following definition from Field (2004: 97): "[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." Both definitions suggest an interrelationship between the two disorders, an interrelationship acknowledged by Berninger & Wolf (2009: 135) and Hendrickx & Salter (2009: 107), among many others.

But while the focus will be on the developmental type, it will be inevitable to refer to the typology of dyslexia and dysgraphia symptoms that have been observed in the acquired type, as they seem to have been more elaborately described in the literature than those for the developmental type. For instance, there is an interesting distinction that has been made, e.g. by Field (2004), within the acquired but not the developmental type: that between "*peripheral dysgraphias*"[1] and "the three main types of *central dysgraphia* which are similar to the categories of central dyslexia" (p. 96). The three are: *surface* dysgraphia/dyslexia, *phonological* dysgraphia/dyslexia, and *deep* dysgraphia/dyslexia.

A good summary of the definitions of these terms is given in the following passage consisting of statements quoted from Crystal (2010: 282) but which have been rearranged from different paragraphs for easier comparison:

[1] According to Field (2004), *peripheral [acquired] dysgraphias* are the "impairments involving the physical act of writing" (p. 96), while *peripheral [acquired] dyslexias* refer to the "impairment of the system which permits visual analysis" (p. 98); in *central dyslexias*, it is the "processing of the signal [that] is affected" (p. 98).

> [**Phonological dyslexics**] are unable to read on the basis of the "phonic" rules that relate to graphemes and phonemes […]. This means that they can manage to read familiar words, but they have great difficulty with new words (such as technical terms) or with simple nonsense words (such as *lak*). **[Phonological dysgraphics]** can spell real words but not nonsense words […]. [**Deep dyslexics**] are unable to read new or nonsense words, but in addition they make many semantic errors (e.g. reading *forest* as "trees"). [They also make] visual errors (e.g. reading *signal* as "single"), and errors that combine visual errors and semantic properties (e.g. reading *sympathy* as "orchestra" […]. Words with concrete (as opposed to abstract) meanings are easier to read. [**Deep dysgraphics** have] no ability to spell on a phonetic basis; [for instance] a dictated nonsense word […] is often replaced by a real word that is similar in sound (e.g. *blom* is written *flower*, presumably because of the word *bloom*). Errors seem to be semantically related (e.g. one person, asked to write *bun*, wrote *cake*). The spelling of words with concrete meaning is better than that of words with abstract meaning. [**Surface dyslexics**] are very poor at recognizing words as wholes […] Irregular words (such as *yacht*) pose [them] particular difficulty. [They also have] a problem with homophones […]. [**Surface dysgraphics**] can spell spoken nonsense words in a plausible way, but cannot spell irregular real words (e.g. one person wrote *biscuit* as *bisket*) – and even regular words may be affected. [Their] whole-word spelling is impaired, though not entirely lost (e.g. one person spelled *yacht* as *yhagt* […].).

Even though not all the symptoms of acquired dyslexia/dysgraphia are expected in developmental dyslexia/dysgraphia[2], the quotation above contains specific symptoms which we should expect while analysing the data collected for the present study: (i) semantic errors, (ii) visual errors, (iii) replacing words with those that are similar in sound, (iv) the inability to recognize words as wholes, (v) a greater difficulty posed by irregular

[2] For instance, Field (2004) points out that "Clear cases of the semantic errors which characterize *acquired deep dyslexia* are not common [in developmental deep dyslexia]" (p. 100).

words, (vi) familiar words being easier to read than less familiar ones, and (vii) a greater difficulty posed by abstract nouns. On the other hand, we should not expect any reading or writing difficulty related to new and nonsense words, for the simple reason -- as will be explained in the methodology section -- that such words were not included in the elicitation lists and sentences which the subjects were asked to read and write: only (real) words that were assumed to have been taught (and, hence, those familiar to the subjects) were used.

In terms of predicting what the present study might find, there is not much that it can rely on in terms of existing research that has been conducted in Kenya on the two language disorders: the authors are aware of only two, to date: Kiongo (2013), on dyslexia, and Ondieki (2013), on dysgraphia. 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.

Kiongo's study is more informative, if anything because it used a larger sample (though still a small one in absolute terms). It observed that the dyslexic subjects had difficulties with both function words and content ones, with the errors made consisting mainly of substitution, omission, insertion, and reversal of sounds. Like Kiongo's, the present study compared the subjects' performance on function vs. content words, primarily with a view to seeking corroboration for the observation made in the existing literature on language disorders -- be they those acquired, like aphasia (see e.g. Radford et al., 2009, chap. 15), or those which, in all likelihood, have a genetic basis, like specific language impairment (see e.g. Fromkin et al., 2011, p. 21) and indeed developmental dyslexia and dysgraphia (see e.g. Field, 2004, p. 100) -- that function elements (both words and inflections) are a greater source of difficulty. To illustrate this, Shaywitz (2003), for instance, writes: "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" (p. 112).

By way of suggestion for further research, Kiongo (2013) specifically expressed the need to explore the relationship between children's reading and writing difficulties. She put it this way: "Since dyslexia involves dysgraphia […], it would have been more illuminating if the respondents' reading and writing skills [had been] compared so as to come up with a [clearer] picture of each one of them than the present study did" (p. 50). In other words, she called for studies that investigated the degree of correlation between reading and writing difficulties. The present is one such study.

2. METHODOLOGY

2.1 The subjects

The subjects were class 5 to class 8 pupils from nine public primary schools: Hamuyundi, Endeli, Bukulunya, Demesi, Budaywa, Simboyi, Gahumbwa, Egaloni and Kivuye. As a first step, the pupils were identified as dyslexics and dysgraphics by their teachers on two parameters: first, the teachers found the said pupils' reading and spelling age much lower than was expected of their chronological age; second, according to the Ministry of Education's expectations, as stipulated in the Kenya Institute of Curriculum Development (KICD) syllabus for primary schools. As a second step, the present study administered, to the group selected by the teachers, an independent test, which involved reading words from the English syllabus for Standard Two (that is one at least three grades below the academic level of the subjects) and a free composition. Twenty-five pupils (19 boys and 6 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 items that were used to test the subjects were selected from words which had been taught to the pupils more than two grades earlier, that is words which learners at the same level of study should normally have no difficulty at all reading and writing. The subjects

were aged between ten and sixteen years. For the purposes of this study, the full names of the subjects were omitted (in the results tables and in the discussion of the results); they were replaced with the initials of their name(s), preceded by an initial representing their school.

2.2 Data collection procedure

The same words were used to test both dyslexia and dysgraphia. A list of twenty content words and another of eleven sentences were used. The twenty words are: *handkerchief, bite, handwriting, right, remember, train, engine, neat, vehicle, knife, secretary, knee, spelling, fence, envelope, throw, environment, tree, interesting, cure*. The same words were put in context in the following sentences:

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**.*

The ten function words used in this study were also presented in the same sentences above. The target words are: *cannot, that, over, an, us, very, don't, there, for, I.*

All the words were selected from the Kenya Institute of Curriculum Development (KICD) syllabus for primary schools. They were selected from the vocabulary and grammar items recommended for Standard Two and Standard Three. With these levels being at least two grades below the

academic level of the subjects of the present study, it is expected that all of these had previously encountered the words used in this study. The subjects were first asked to read the words in isolation and then in context. The reading tasks were presented to the subjects before the writing ones. Each subject performed the reading tasks individually and away from the rest. Their reading was recorded using a voice recorder. Regarding the writing tasks, the words and sentences were dictated to the whole group of subjects within each school. The list of words in isolation was dictated first.

2.3 Data analysis procedure

The data will first be presented in tables indicating the subjects' performance on both the reading and writing tasks. Then, in order to test the extent of the correlation between the subjects' reading and writing abilities, the Pearson correlation will be used, while the chi-square test will be used to test whether function words proved to be a greater source difficulty than content words.

3. RESULTS PRESENTATION AND DISCUSSION

3.1 Results from the dyslexia-related tasks

3.1.1 Results tables

The results are presented in 3 tables: Table 1 presents the subjects' reading of ten monosyllabic content words in isolation, Table 2 the subjects' reading of the same content words in context, and Table 3 the subjects' reading of ten function words in context.[3]

[3] Initially, the study involved polysyllabic words (both in isolation and in context) as well, but the tables reporting on their results will not be presented in the present report for lack of space.

Table 1: The subjects' reading of ten content words in isolation[4]

Target word → / **Subjects ↓**		***bite***	***right***	***train***	***neat***	***knife***	***knee***	***fence***	***throw***	***tree***	***cure***	Tot. Cs	%
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	ragashditi	taraina	/neati/	ranife	kanei	fenike	tarewa	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

[4] Since this table and the subsequent ones on dyslexia-related results report the subjects' pronunciations, the words indicated against each subject should have been in phonetic symbols. However, for practical purposes, we decided to represent their pronunciations by the spellings corresponding to them. For instance, the word *bite* was pronounced as /bet/ by Subject No. 1, as /bat/ by No.5, as /bit/ by No. 9, etc. We only represented by sound symbols the words between slashes / / for the pronunciation of words the spellings of whose letters are likely to cause confusion. This is the case of, for instance, *cure*, the spelling of which with the letter *c-* (as in *curr*) can easily create confusion in pronunciation.

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	/kurr/	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 Cs		2	8	6	3	15	0	1	2	16	3	56	
%		8	32	24	12	60	0	4	8	64	12		22

C: correct reading

Table 2: The subjects' reading of the ten content words in context

Target word → / Subjects ↓		***bite***	***right***	***train***	***neat***	***knife***	***knee***	***fence***	***throw***	***tree***	***cure***	Tot. Cs	%
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	ronigashi	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	cavis	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 Cs		2	10	8	3	15	1	5	4	18	3	69	
%		8	40	32	12	60	4	20	16	72	12		28

Table 3: The subjects' reading of ten function words in context

Target word → / **Subjects ↓**		***cannot***	***that***	***over***	***an***	***us***	***very***	***don't***	***there***	***for***	***I***	Tot. Cs	%
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/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	form	c	3	30
13	HAP	gan	-	-	-	doi	-	-	-	were	thema	0	0
14	HMC	ca-not	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	do not	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	do no	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	-	envery	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 Cs		8	10	11	6	5	12	12	10	10	18	102	
%		32	40	44	24	20	48	48	40	40	64		40

3.1.2 Discussion of the dyslexia-related results

3.1.2.1 The key observations about the expected dyslexia symptoms

There are only two symptoms that are significantly manifested in the subjects' reading: a) the inability to recognize words as wholes -- which is a symptom of surface dyslexia, and b) visual errors -- which are a symptom of deep dyslexia. But there are also a few cases, which cannot be ignored, of words being replaced by those with a similar pronunciation -- thus a case of deep dyslexia as well. However, quite surprisingly (at least on the face of it), there are no semantic errors, which would have led the subjects to replace the target words with different ones having related meanings -- except for the case of function words, where *the* was read for *an,* and *a* read for *an*. And the results do not suggest that abstract words (e.g. *handwriting, spelling* and *environment*) were more difficult to read than concrete ones (e.g. *engine, secretary* and *envelope*), which would be another case of deep dyslexia.) Nor do they suggest that "more irregular words" (that is, those whose pronunciations are quite distant from their spellings, e.g. *knife*) were more difficult to read than the "less irregular ones" (that is those whose pronunciations correspond more or less directly to their spellings, e.g. *fence*), which would be a case of surface dyslexia. Concerning the issue of whether "more" familiar words were read more easily than the "less" familiar ones, which would be a case of phonological dyslexia, there is strong indication that they were.

The next paragraphs look at each one of the observations summarized in the preceding paragraph in detail.

a) The inability to recognize words as wholes

Starting with the content words, be they in isolation or in context, all the ten words by and large kept the initial letter of the target word: it must be stressed it is *letter,* rather than the sound, even though we are dealing with reading, because for both *knife* and *knee*, where the initial letter *k-* is silent in normal pronunciation, it was widely realized as /k/ in the subjects'

dyslexic pronunciation. Likewise, the initial letter *t-* of *throw* reappeared as the sound /t/ in 16 of the 23 cases of misreading in Table 1 and 8 of the 21 cases of misreading in Table 2. This frequent maintaining of the initial letter-cum-sound is an indication that the subjects recognized at least the very beginning of the word, but hardly anything else beyond that. The only word in which they frequently recognized almost the entire word is *bite*, the three letters of which, *bit*, appeared as its pronunciation in 8 of the 23 mispronunciations of it in Table 1 and in 15 of the 23 mispronunciations in Table 2.[5]

Turning to the function words, which were presented only in the context of eleven sentences, the recognition of just the initial letter/sound was a frequent occurrence as well, though less frequent than in the case of the content words: it occurred in the majority of cases of the wrong reading of *there*, *cannot*, and *us*, in a significant minority of cases of the wrong reading of *that, an, don't* and *over*, but in a small minority of cases in the reading of *very, for* and *I*.

b) Instances of visual errors

These are cases where the same letters as in the target word were used but transposed in the wrong positions, or where fewer letters were involved, or where words with similar spellings were substituted for the target ones. In relation to the content words, examples are, from Table 1: the reading of *bite* as *bit* (9 times), as *bet* (5 times), and as *bat* (4 times); that of *right* as *light* (3 times), and even as *ring* (3 times); that of *neat* as *net* (8 times); that of *knife* as *kinf* (4 times); that of *knee* as *ken* (4 times); and that of *throw* as *trow* (7 times). However, these frequencies reduced when the same words were read in context (see Table 2), except for *bit* (15 times) read for *bite*. Notice, for instance, that this time round there was not a

[5] An explanation of why the subjects failed to read the word as fully *bite* seems to have been provided by Ellis (1984), who 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'" (p. 115).

single instance of *bite* being read as *bet*, and that there were only two instances of it read as *bat*.

Concerning visual errors in the reading of the function words, a glance at Table 3 shows that on the whole they occurred less frequently than in the case of content words used in context (in Table2). Of those that did, three cannot be ignored: the pronoun *us* was read as *use* (which, as either a noun or a verb, is a content word) in 11 of the 20 instances where it was misread; the existential pronoun *there* was read as the definite article *the* (also a function word) in 8 of the 15 instances where it was misread, while the indefinite article *an* was read as *a* (its variant as an indefinite article) in 8 of the 19 instances where it was misread.

c) Words substituted for by those with a similar pronunciation

There are actually no similar pronunciations per se among the mispronunciations reported in tables 1, 2 and 3. But there are some close ones, not many, which are worth pointing out. "Close pronunciation" will be determined here on the basis of the pronunciation of the vowel sound, since the words concerned are monosyllabic -- with the exception of three function words (*cannot, over* and *very*) which have two syllables. In the case of the content words in isolation (Table 2), the following close mispronunciations occurred: *light* (3 times) for *right, face* (2 times) for *fence, three* (2 times) for *tree*, and /kure/ (3 times) for *cure*. In the case of the content words read in context (Table 3), only the following pronunciations occurred more than once: *face* (3 times) for *fence, trow* (3 times) for *throw,* and *three* (3 times) for *tree*. Concerning the function words (Table 3), hardly any convincing case of close pronunciation was produced: the closest one could mention is the pronunciation of *very* as *every* (3 times).

All in all, production of a similar pronunciation as a symptom of deep dyslexia, cannot be said to characterize the reading of the present study's subjects.

d) Limited effect of irregular spelling

In terms of "irregular spelling", it can be argued that out of the ten content words (*bite, right, train, neat, knife, knee, fence, throw, tree, cure*) which were presented to the subjects, *right, knife*, and *knee* were the most irregular, since they contain at least one consonant letter that is not sounded. Further, it would not be unreasonable to hypothesise that *right* (with a sequence of three consonants, only one of which gets sounded in the end) would cause greater difficulty than *knife*, which, in turn (for containing a silent consonant and a silent vowel) would cause greater difficulty than *knee* (with just a silent consonant).

However, against such expectations, the subjects' reading produced a different picture altogether: while *right* turned out indeed to be more difficult to read than *knife*, with only a 32% correct-reading rate for the former against a 60% rate for the latter in the words-in-isolation case in Table 1 (and a 40% vs. a 60% correct-reading rate in the words-in-context case in Table 2), both *right* and *knife* turned out to be a lot easier to read than *knee*. Quite surprisingly, this latter scored a 0% correct-reading rate in the words-in-isolation case and only a 4% rate in the words-in-context case, and in both cases the lowest rate of all the ten words. It is difficult to understand how not a single one of the 25 subjects was able to correctly read the word *knee* in isolation. This clearly shows that the irregular-spelling criterion did not work in this experiment. Further proof for this comes from the fact that the word *fence*, which, arguably, was the most regular in terms of spelling-sound correspondence, scored the second lowest correct-reading rate (of 4%, meaning that only 1 out of the 25 subjects was able to read it correctly) in the words-in-isolation case. (In the words-in-context case, in Table 2, five subjects read it correctly, that is a 20% correct-reading rate, one still much lower than that for *right,* 40%, and that for *knife,* 60%.)

Unlike in the case of the content words, in that of the function ones, the irregular-spelling factor seems to have played some role, despite the fact that there are no glaring spelling irregularities in the ten words

involved. Arguably, the most regular of them was the pronoun *I*, simply because it is composed of just one letter pronounced as it is in the alphabet. Since it is this very pronoun that scored the highest correct-reading rate, 72% (that is 18 out of 25 subjects), the spelling-regularity factor must have played a role. Conversely, it could also be argued that the plural pronoun *us*, though composed of just two letters, has got the most irregular spelling of the ten words, to the extent that its letter *u-* is, unlike *I*, not pronounced the way it is in the alphabet. So, the fact that *us* scored the lowest correct-reading rate (20%), with 11 of the 20 subjects (i.e. 55%) who misread it reading it as if it were *use* (/juz/ or /jus/), can be adduced as further support for the regularity-of-spelling argument.

However, this argument gets weakened by the fact that the article *an* scored an almost equally low correct-reading rate (only 24%) as *us*, yet, unlike this latter, it was supposed to be read exactly as it was spelt. It is quite surprising that 19 (i.e. 76%) of the 25 subjects failed to read it this way. Interestingly, more than half (i.e. 8/13) of those who misread it read it just as *a*, thus dropping, or simply not seeing, the *-n*. That *an* was a difficult word to read is also reflected in the fact that it was the most avoided of the ten function words: 5 (i.e. 20%) of the 25 subjects skipped it altogether.

e) The word-familiarity effect

This effect is difficult to assess in the present case because although all the words the subjects were asked to read had been taught to them previously, the frequency at which they later encountered them must have varied with individual words. Unfortunately, there is no certain way of telling which words were encountered more frequently than the others. One can only make some informed assumptions about the potential frequency of specific words: for instance, since trains and fences are not part of everyday realities of the schoolchildren used as the subjects in the present study, we can assume that the words *train* and *fence* were not familiar words at all. Conversely, with knees, knives and trees being an everyday reality, we can

assume that the words *knee, knife*, and *tree* were quite familiar to the subjects. If word familiarity was a key factor in reading the ten words, then we would expect the correct-reading rates to be significantly higher for the latter three words than for the former two.

Here are the respective figures: first, for the words-in-isolation case: *knee*: 0%, *knife*: 60%, *tree*: 64%, *train*: 24%, *fence*: 8%; second, for the words-in-context case: *knee*: 4%, *knife*: 60%, *tree*: 72%, *train*: 32%, *fence*: 20%. The picture is quite clear: both *knife* and *tree* recorded much higher rates of correct-reading than *train* and *fence*; the rates for the former two are actually the highest two of all the ten words, and are well above the mean rates (of just 22% in the words-in-isolation case and 28% in the words-in-context case). Clearly, word familiarity must have been a determinant, which is consistent with what has been reported in the literature on related language disorders: for instance, Radford et al. (2009: 218) concluded that "Low-frequency words yield more paraphasias [i.e. errors in content words] than high-frequency words" (p. 218). However, the extremely low (the lowest, actually) correct-reading rates for the word *knee* remain a puzzle, unless one may want to speculate that *knee*, despite it being something the subjects saw on a daily basis, barely was it talked about. That is, it is one of those "very familiar words" but "which happen not to be used frequently", as recognized in the *Oxford 3000™* introduction in the *Oxford Advanced Learner's Dictionary* (2015, 9th edn.)[6]

Turning to the function words, one word, the first-person pronoun *I*, stood out from the rest: not only is its correct-reading rate the highest (72%), but it is also the only one above 50%. Its much higher rate may have to do with its "simpler" spelling, as argued in the previous sub-section, but it also may have to do with its expected high frequency. But whether this is higher than that for the other words is difficult to establish since (if we take British English as the reference, for lack of similar information on Kenyan English) all the ten function words in the list are reported to be

[6] Indeed, "words for parts of the body" are specifically mentioned as an example of such words.

among the 3000 words "most frequently used in English" not only by the Oxford 3000™, but also, except for *cannot* and *don't*, by the *Longman Communication 3000* (associated with the *Longman Dictionary of Contemporary English* -- see e.g. its 5th edition of 2009). This latter goes even further to indicate that all the remaining eight (*that, over, an, us, very, there, for, I*) are actually among the 1000 words most frequently used, be it in spoken or written English.

Perhaps, then, the only criterion left to resort to is to compare words within the same sub-category (i.e. pronoun, preposition, modal verbs, etc.). In this connection, only *cannot* and *don't* (as modal verbs), *over* and *for* (as prepositions), and *us* and *I* (as personal pronouns) can be compared. of the three pairs, the correct-reading rate figures appear to be significantly different for just *us* and *I*: only 20% against 72%. This huge difference between the two pronouns can be attributed to frequency: the table of "distribution of individual personal pronouns" in Biber et al. (1999) shows that the singular pronoun *I* is by far more frequent than its plural counterpart *us* (especially in the conversational register, where it is reported to occur 37 times more than *us*).

f) Lack of effect of the abstract-concrete-noun contrast

This contrast concerns only content words. Not much will be said about it because, unfortunately, it turned out that only five (namely *train, knife, knee, fence,* and *tree*) of the ten words used in the study were unambiguously nouns, and all of these are concrete. However, results from the same subjects' reading of the following ten polysyllabic words (*handkerchief, handwriting, remember, engine, vehicle, secretary, spelling, envelope, environment, interesting*), but the tables for which have been left out of this paper for reasons of space, seem to indicate that whether the nouns were concrete (*handkerchief, engine, vehicle, secretary, envelope*) or abstract (*handwriting, spelling, environment*) was of no effect: in the words-in-isolation case the lowest correct-reading rates were recorded by *secretary* (0%), *envelope* (4%), *engine* (8%), and *vehicle*

(12%), all of which are concrete nouns. The rates for the three abstract words are: *handwriting* (16%), *spelling* (16%), and *environment* (24%). (The highest rates, the only ones above 24%, are 64% for the verb *remember* and 52% for the concrete noun *handkerchief*. The rate for the remaining word, the adjective *interesting*, is 16%.)

The picture is very similar in the words-in-context case: *secretary* (0%), *envelope* (4%), *vehicle* (8%), *engine* (12%), *handwriting* (20%), *spelling* (24%), *environment* (28%), *remember* (56%), *handkerchief* (44%), and *interesting* 16%. Clearly, there must be a factor other than concreteness, but an unclear one, that made *remember* and *handkerchief* the easiest words to read, and *secretary*, *envelope*, *vehicle*, and *engine* the most difficult ones. Not even familiarity-cum-frequency seems to be of relevance here, since it is hard to imagine how *secretary* and *envelope* could have been less familiar to the subjects than e.g. *environment* and *spelling*.

3.1.2.2 The subjects' overall performance on the individual words

The results displayed in the tables above clearly suggest that the subjects under study were indeed dyslexic: the mean correct-reading rate for the content words in isolation (Table 1) was only 22%, that for the same content words in context (Table 2), although higher, was only 28%, while that for the function words in context (Table 3), although even higher (40%), but still below 50%.

The key observations from Table 1 are the following: not a single one of the 25 subjects was able to correctly read half of the ten words; three (i.e. 12%) of the 25 subjects (Nos. 6, 13, and 19) could not read a single one of the ten words, and four (Nos. 5, 10, 12, and 15) were able to read only one. In relation to the ten words that were to be read, only two, *knife* and *tree,* turned out to be relatively easy to read: only they were read by at least half of the subjects. Four words turned out to be the most difficult to read: *knee,* which was not read by even one subject (i.e. a 0% correct-reading rate); *fence*, which was read by just one subject (i.e. a 4% rate), and *bite* and *throw*, which were read by only two subjects (i.e. a 8% rate).

The key observations from Table 2 are the following: it seems that the putting of the ten content words into context enhanced, although not dramatically, the subjects' ability to read them: the correct-reading rate improved from 22% (Table 1) to 28% (Table 2). This improvement can be attributed to the fact that 4 subjects (against 0 in the words-in-isolation case) correctly read at least five of the ten words. However, exactly as in the latter case, 3 subjects (Nos. 5, 6, and 19) were not able to read a single word correctly, while 3 subjects (Nos. 10, 13, and 15), compared to 4 in the words-in-isolation case, were able to read only one word. Notice that subjects Nos. 6 and 19 were not able to read a single word both in isolation and in context, while Nos. 10 and 15 were able to read only one word on both tasks. It is Nos. 2, 16, 18, and 24, who improved most on the second task, which is not surprising because they are among the seven subjects who scored a correct-reading rate of 40% (the highest) on the first task, except for No. 18 (with a 30% rate).

Regarding the words that were to be read, exactly as in the words-in-isolation case, only *knife* and *tree* were read by at least half of the subjects, and *knee* and *bite* remained the most difficult to read; they were correctly read by just 1 and 2 subjects, respectively. The correct-reading rate improved from only 1 subject to 5 of them for the other difficult word, *fence*. However, it remained very low and the same for two words, *neat* and *cure*, at 12%, that is just 3 subjects.

From a comparison of the subjects' reading of the content words in context (Table 2) and that of the function words (Table 3) read in the same context of eleven sentences, the following key observations emerge: first, contrary to what the present study had hypothesized, the overall correct-reading rate was much higher for the function than for the content words: 40% vs. 28%. One illustration of the better performance on the function words lies in that the fact while the highest correct-reading rate was 70% (scored by only one subject, No. 24) on the content words task (Table 2), on the function words task (Table 3) five subjects scored at least the same rate, three of whom scored higher than 70%: No. 16 scored a 100% rate (but

against a rate of only 60% on the content words, though still the 2nd highest), while Nos. 1 and 24 scored a 90% rate (against respective rates of 30% and 70% on the content words).

In terms of statistical significance of the higher performance on the function words task, a chi-square test was done which showed that the difference between the two frequency percentages (22% vs. 40%) was statistically significant: the calculated chi-square value was 45.62 at 1df, which is much higher than the critical value of 3.84 at 1df at the 5% significance level (and even that of 6.64 at the 1% level). If one refers to observations made in the literature, the better performance on function words is hard to explain because not even their likely higher frequency in the English language seems to be a factor: *don't*, for example, the only function word that is not among the top 3000 most frequent words in English, scored a higher correct-reading rate (48%) than six words (*that, over, an, us, there, for*) that are even among the top 1000.

The second observation is that even though the function words recorded a higher performance, they at the same time scored a higher omission rate, with some subjects not even attempting to read some of them: while there were only 8 omissions (i.e. 3.2%) in the case of the content words (Table 2), there were 19 of them (i.e. 7.6%) in the case of the function ones (Table 3). Note, though, that in the latter case more than 70% of the omissions (14/19) were made by just three subjects: No. 5 (with 3 omissions), No. 13 (with 6), and No. 23 (with 5), while in the former case the 8 omissions were made by 8 different subjects. (It is worth pointing out that subjects Nos. 13 and 23 are the same who could not correctly read a single one of the ten function words under study.) In terms of which function words were the most omitted, surprisingly it is two (namely *an* and *I*) of the shortest three.

The third observation concerns the lowest correct-reading rates on the two reading tasks: on the content words task, the lowest rates were recorded by Nos. 5, 6, 19 (all three with a 0% rate) and Nos. 10, 13, and 15, (all three with just a 10% rate), while on the function words task, the lowest rates were recorded by Nos. 13, 17, and 23 (all with a 0% rate) and Nos. 6,

7, 8, and 10 (all with only a 10% rate). It thus transpires that subjects Nos. 6, 10 and 13 did really badly on both tasks.

3.2 Results of the dysgraphia-related tasks

3.2.1 Results tables

The results are presented in three tables: Table 4 presents the subjects' writing of ten monosyllabic words in isolation, Table 5 their writing of the same words in context, and Table 6 their writing of ten function words in the same context.

Table 4: The subjects' writing of ten content words in isolation

Target word → Subjects ↓		***Bite***	***right***	***train***	***neat***	***knife***	***knee***	***fence***	***throw***	***tree***	***cure***	Tot. Cs	%
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	klwe	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	BAniti	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
Tot. Cs		7	3	3	5	5	4	3	2	18	5	55	
%		28	12	12	20	20	16	12	8	72	20		22

Table 5: The subjects' writing of the ten content words in context

Target word → Subjects ↓		*Bite*	*right*	*train*	*neat*	*knife*	*knee*	*fence*	*throw*	*tree*	*cure*	Tot. Cs	%
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 Cs		5	2	4	3	4	2	3	3	19	2	47	
		20	8	16	12	16	8	12	12	76	8		19

Table 6: The subjects' writing of function words dictated in context

Target word → / **Subjects ↓**		***cannot***	***that***	***over***	***an***	***us***	***very***	***don't***	***there***	***for***	***I***	**Tot. Cs**	**%**
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 Cs		5	16	9	2	3	7	4	3	11	12	72	
%		20	64	36	8	12	28	16	12	44	48		29

3.2.2 Discussion of the dysgraphia-related results

3.2.2.1 The key observations about the expected dysgraphia symptoms

To start with, the **phonological dysgraphia** effect that is manifested in the phonological dysgraphics' ability to spell real words but not nonsense words cannot be expected in the present study, simply because no nonsense words were included in the list that was dictated to the subjects.

There is, however, a potential symptom of phonological dysgraphia that is also expected to be one of deep dysgraphia: the subjects' lack of ability to spell on a phonetic basis, as a result of which dictated irregular words (in the absence of nonsense words in the present study) are often replaced by real words that are similar in sound. The general picture from tables 4 & 5 (of content words) is that there does not seem to be evidence for this phenomenon because, while the misspellings produced for most of the ten words contain some of the sounds in the target word, notably the initial sound, they are not real words in English. This should be understandable since those ten content words, with the exception of *right*, do not have homophones in the first place. For *right*, which has them, they did indeed turn up as misspellings for it: it was written as *write* 3 times in Table 4 and 3 times in Table 5, by exactly the same subjects (Nos. 16, 21, 22) in both cases, and as *rite* by No. 8 in Table 4. Note that homophonous non-words were produced as well: for instance, *rait* was written 3 times for *right* in Table 4 and once in Table 5, while close homophones *kiwa* (written 5 times in Table 4), *kiewa*, *kiwer*, *kua, qua,* and *quwa* were produced for *cure* in Table 4 and/or Table 5. This seems to show that while most of the subjects had the right sound in in mind, they had the wrong letter to correspond to it. The use of the letter *k-* in *kiwa, kiwer* and *kua* suggests that the subjects most likely borrowed it from their mother tongue (Lulogooli), where the /k/ sound is not represented at all by the letter *c-*. Note also that the same kind of phonetic spelling is also evident in Table 6, particularly regarding the

word *cannot*: 8 of the 20 misspellings of it start with the letter *k*-, against only 5 that start with *c*-.

Regarding possible real-word homophones in Table 6 (of function words), only *their* was produced (3 times) for *there*. No real-word homophone was written for the other two words (*for* and *I)* in the list with potential real-word homophones (*four* and *aye*).

The next symptom related to deep dysgraphia has to do with the subjects' errors appearing to be semantically related to the target words. Evidence for this would have meant that real words that are semantically related to the target ones were wrongly written for the latter, but there is not a single instance of this to report across the three tables (4, 5 & 6). Few of the very many misspellings appearing in these tables are real words in the first place: in Table 4, only 19 (i.e. 9%) of the 195 misspellings and, in Table 5, only 25 (i.e. 12%) of the 203 misspellings are. Only in Table 6 do we have a relatively meaningful percentage of real words: 58 (i.e. 33%) of the 178 misspellings are. But all those real words are phonologically, not semantically, related to the target words: that is the case of the 3 occurrences of *write* for *right* in Table 4 (and another 3 in Table 5) and of the 3 *nits* for *neat* in Table 4. Similarly, in Table 6, *the* was written 9 times for *there*, but the two are not semantically-related; nor are *don't* and *dot* (written 5 times for it) and *us* and *as* (written 4 times for it). The only (apparent) exception is the article *a*, written 6 times for its phonetic variant *an*.

It is worth adding that there were even much fewer occurrences of real-word misspellings, even when only phonetically-related, in the case of polysyllabic words. The figures from the tables (that were not reproduced in this paper for reasons of space) of such words, all content words, are the following: only 5 (i.e. 2%) of the 235 misspellings produced when the words were dictated in isolation are real words, and the figures are exactly the same (5/235) when the words were dictated in the context of sentences. In the former case, the 5 words are tokens of *handwrite (*written 3 times for *handwriting)* and *envelop (*written 2 times for *envelope)*. In the latter case,

the 5 consist of 1 occurrence of *write*, 2 of *handwrite* and 1 of *handwrote*, all three written for *handwriting*, and 1 occurrence of *ski* written for *secretary*. The misspellings for *handwriting* and *envelope* would make one believe that in this case the subjects produced semantically-related real words, but if this were really a feature of the subjects' dysgraphia, one would have expected some occurrences e.g. of *interest* for *interesting*, of *engineer* for *engine*, and of *spell* for *spelling,* but none occurred.

All in all, the misspellings produced by the subjects in the present study do not provide evidence for semantically-related real words as a symptom of deep dysgraphia. Neither is there any for the other, meaning-related, aspect of deep dysgraphia that would have consisted in spelling words with concrete meaning better than those with abstract meaning. To illustrate with the list of polysyllabic words, which contains both concrete and abstract nouns, the picture is the following: of three words that scored a 0% correct-spelling rate (i.e. which none of the 25 subjects was able to spell correctly) when dictated in isolation, two (*secretary* and *envelope)* are concrete and one, *environment*, is abstract. Likewise, when the words were dictated in context, a concrete word, *secretary*, scored a 0% correct-spelling rate, as did an abstract one, *environment*; 3 concrete words, *handkerchief, engine*, and *envelope*, scored a lower rate (of 4%) than the other two abstract words in the list, *handwriting* (8%) and *spelling* (12%). So, clearly, the concrete-abstract contrast must have not been a factor.

However, if one added omission of the target words (i.e., simply not even attempting to write them), as a symptom of deep dysgraphia related particularly to function words, following Crystal (2010: 283), who, while illustrating "deep dysgraphic errors", reports, from "responses of one deep dysgraphic patient's to part of a single word dictation test", that "function words are particularly poor: some are not attempted; some bear little resemblance to the stimulus word", then Table 6 provides instances of the symptom which cannot be easily discarded: *zemu, the*, and *themu* were produced for the personal pronoun *I; wnw, wi*, and *we* were produced for the preposition *for;* while *doti* was produced for the pronoun *us* and *wesec*

for the preposition *over* (see subjects Nos. 13, 14, and 15). What is particularly strange (i.e. "deeply" intriguing?) about these misspellings is that they do not contain a single letter corresponding to a single sound of the stimulus words dictated to them.

Turning to the expected symptoms of surface dysgraphia, there seems to be enough evidence for them. The two expected are: (a) the inability to spell irregular (and sometimes even regular) real words and (b) the fact that the whole-word spelling is impaired, though not entirely lost. In relation to (a), the overall, and very low, correct-spelling rates in tables 4, 5 & 6 (22%, 19%, and 29%, respectively) can only mean that the subjects were unable to spell the target words.

To underscore this point, it is worth recalling that in both tables 4 and 5 (of content words), only the word *tree,* out of the ten under study, scored a correct-spelling rate higher than 30% (72% in Table 4 and 76% in Table 5). And while in the case of function words (Table 6) four words (*that, over, for* and *I*) scored a rate higher than 30%, only *that* scored a rate higher than 50%, that of 64%, (i.e. it was spelt correctly by 16 of the 25 subjects).

To dwell a little longer on specific words, not a single subject spelt the word *knee* with its usual initial letter *k*-. Instead, 16 (i.e. 80%) of its 20 misspellings start with the letter *n*-, which reflects the first sound of the word. However, one wonders why the same behaviour did not apply to *knife*, which, too, starts with a silent *k*-, and yet 9 (i.e. 45%) of its 20 misspellings start with *k*-, while another 9 start with *n*-. So, for the appearance (or non-appearance) of the initial letter *k*-, a stronger explanation for the significant difference in the misspelling of *knife* and *knee* should be sought elsewhere: as was argued (in the previous sub-section) in the case of the pronunciation of the two words, the greater rate of appearance of the silent letter *k*- in *knife* than in *knee* must have to do with the assumed higher frequency (and, hence, familiarity) of the former.

Interestingly, the letter *k*-, totally absent from *knee* and partially absent from *knife*, was the one wrongly used to spell *cure* in 10 (i.e. 50%) of its misspellings, twice as many times as the target letter *c*-. Here, of

course, the letter *k-* "correctly" reflects the first sound of the word *cure*. This looks a case of phonetic spelling, which, if extended to the other letter sequences likely to produce a similar pronunciation, occurred in a significant way in the misspellings of at least 6 of the 10 words: *bite* (in its misspellings *bait, baiti* and *buyt), right* (in its misspellings *rait, raits, raiti, rite,* and *write), knife* (in its misspellings *naifi, naifu, naiefu*, and *nuyf*), *fence* (in its misspellings *fez, fezi, fenzi, fesh, fense, fenca,* and *face), train* (in its misspellings *trein, treini, trayn*), and *neat* (in its misspellings *nit, niti, nitis, nitni*).

Another interesting phenomenon that occurred in every single one of the six words (*bite, right, train, neat, knife, fence*) whose pronunciation ends in a consonant is the addition, in the misspelling of them, of a final vowel, mostly *-i,* to create an additional (open) syllable. Thus, Table 4 displays misspellings such as *bati, baiti* and *biti* for *bite*; *raiti, rati, riti*, etc., for *right*; *treini, treni, trini*, etc., for *train; niti, neti, nati*, etc., for *neat; naifi, naifu, nifu*, etc. for *knife;* and *fuzi, fezi, fenzi, fensi*, etc., for *fence*. This tendency to create an open syllable might be an influence from the subjects' first language, Lulogooli, which, as a Bantu language, typically does not allow closed syllables.

A further telling detail concerns the word *throw*, which scored the lowest correct-spelling rate (8%) when dictated in isolation (Table 4). Almost all the subjects (21/23) who misspelt it seem to have failed to perceive the dental fricative sound represented by the letters *th-*; it appears only in two misspellings: *tharo* (No. 7) and *thorw* (No. 22). In 14 (i.e. 61%) of the 23 misspellings, the fricative (whether voiceless or voiced) was apparently heard as the voiceless alveolar stop /t/ or, possibly, as the dental stop /t̪/. "Auditory impairment" has indeed been suggested as a cause of dysgraphia (by e.g. Stein & Walsh, 1997, p. 151).

As regards the whole-word spelling being impaired, this, too, is primarily illustrated by the very many misspellings across the three tables. In Table 4, for example, for 8 of the 10 words (the two exceptions being *knee* and *cure*) it is only the initial letter that is correct: from the second

letter, misspellings abound for 7 of the 8 the words, except for *fence,* in which the second letter *-e-* appears in 13 of the 22 misspellings. But if we were to illustrate this aspect specifically with an example that mirrors *yhagt,* for *yacht* (see Crystal, 2010: 282), in which almost all the word's letters are present but have been transposed, the tables display very few examples of this. The few ones in Tables 4 and 5 actually involve only the words *bite, right, knife* and *throw*: *biet* for *bite* (see No. 1 in Table 5), *rieght* for *right* (see No.11 in tables 4 & 5), *kinfe, knief,* and *knefi* (see Nos. 12, 23, 24 & 25 in Table 4 and Nos. 23, 24, 11 & 12 in Table 5) for *knife*, and *thorw* for *throw* (see No. 22 in tables 4 & 5). What *yacht* and the four words have in common is the fact that they contain at least one silent letter. However, as already pointed out earlier (in the case of dyslexia), the presence of silent letters does not seem to be a strong explanation because, across the two tables, only 1 (i.e. *mke*, produced by No. 11 in Table 5) of the 39 misspellings of *knee* (ignoring the 4 omissions) contains the *-k-* letter.

Concerning the misspellings of function words (in Table 6), there is not a single case comparable to *yhagt* for *yacht*, that is in the sense of its letters having been transposed. There are a few cases, involving only four words, where a letter has been added: *us* has been misspelt as *has* (3 times) and *hus* (1 time), *that* as *thata* (1 time), *very* as *every* (1 time), and *for* as *fort* (1 time) and *form* (1 time).

In a nutshell, the subjects in the present study typically suffer from surface dysgraphia.

3.2.2.2 The subjects' overall performance on the individual words

As Table 4 shows, the subjects' overall performance on writing (monosyllabic) content words was very low, with a correct-spelling rate of just 22%, as in the case of dyslexia. When the same words were dictated in context (i.e. within sentences), they were not better spelt: the correct-spelling rate actually worsened, falling to 19%. As for function words, Table

6 shows that they too scored a very low correct-spelling rate (29%), even though this was significantly higher than the 22% for the content words.

The key observations from Table 4 (of the content words dictated in isolation) are the following: first, even though the table shows the same overall performance as Table 1 (or dyslexia-related results), with a correct rate of 22%, there are big differences between the specific words produced in writing and those produced in reading, which points to a great lack of letter-sound (i.e. grapheme-phoneme) correspondence on the part of the subjects. One striking example concerns the word *bite*: it was spelt as *bit* only once (i.e. 4%), while it was read as *bit* 15 times (i.e. 60%). (This misreading was attributed to surface dyslexia, which prevents the subjects from seeing a word as a whole.[7]) The same differences might account for why, unlike in reading, *knee* (16%) and *knife* (20%) were no longer the most difficult words to write; they scored higher than *throw* (8%), *fence* (12%), *train* (12%), and *right* (12%). However, *tree* (with a 72% correct-spelling rate) again turned out to be the easiest word. Likewise, *fence* was, as in the case of dyslexia, was among the most difficult words to write, which is still puzzling.

Second, although the overall performance on writing individual content words in isolation (Table 4) was the same as that on reading the same words (Table 1), with a mean rate of 22% in either case, there are revealing differences worth pointing out: as Table 4 shows, 5 (i.e. 20%) of the subjects (Nos. 4, 6, 9, 10, 15) were not able to correctly spell a single one of the ten words, against only 3 subjects (12%) in the case of reading. On the other hand, another 5 subjects (Nos. 11, 24, 25, 16, 17) scored a correct-spelling rate of at least 50% (with the highest being 70%), while not a single one scored a 50% correct-reading rate (with the highest being 40%). So, despite similar mean correct-spelling and correct-reading rates, the differences between the individual subjects were greater in the case of writing than in that of reading.

[7] But it can equally be attributed to phonological dyslexia, because of that lack of grapheme-phoneme correspondence.

Turning now to the key observations from Table 5 (of the content words dictated in context), the first one is that the overall correct-spelling rate was even lower (19%) than that of the same words dictated in isolation (22%). This suggests that the linguistic context around the target words was a source of difficulty, rather than of ease, in spelling them. Apparently, this lower rate has to do, at least in part, with the very many omissions of words: 37 of them, compared to only 2 when the same words were dictated in isolation (Table 4). Three words recorded high levels of omission: *cure*, which was omitted 8 times (out of the 25 expected occurrences), *neat*, omitted 8 times, and *right*, omitted 6 times. There was 0 omission for just two words, *fence* and *tree*, and just 1 omission for only one word, *throw*.

To relate the same very low correct-spelling rate to the performance of individual subjects, six (i.e. 24%) of these (Nos. 4, 6, 10, 13, 15, 19) could not spell a single one of the ten words correctly, while another 8 (32%) subjects could spell only one word. These figures are almost identical to those for the words-in-isolation case (5 subjects with a 0% rate and 8 subjects with a 10% rate). In fact, 4 subjects (Nos. 4, 6, 10, 15) scored a 0% rate of correct spelling in both cases. Only 4 (i.e. 16%) subjects (Nos. 17, 18, 23, 24) scored a correct-spelling rate of (just) 50%, two of whom (Nos. 17 and 24) scored at least 50% in the words-in-isolation case.

As concerns the key observations from Table 6 (of function words, all dictated only in context), their overall rate of correct-spelling was low as well, only 29%, much lower than the corresponding correct-reading rate (in Table 3) for the same words (40%), but much higher than the correct-spelling rate for the content words in context (19%) in Table 5. This means that, contrary to what had been hypothesized, the function words were (relatively) easier to write than the content ones.

In terms of how individual subjects performed on them, only two subjects (Nos. 8 and 10) scored a 0% correct-spelling rate, while 7 of them were able to correctly spell only 1 word (i.e. a 10% rate). On the other hand, 6 (i.e. 24%) of the 25 subjects scored at least a 50% correct-spelling rate, among whom No. 1 (with a 90% rate) and No. 22 (with an 80% rate).

In terms of the performance on individual words, the article *an* was the most difficult to spell, with only 2 subjects (i.e. 8%) being able to spell it; it was followed by the personal pronoun *us* and the existential pronoun *there*, with a 12% correct-spelling rate each. There were very many omissions on this task: 52 of them (out of 250 possible occurrences; hence, a 21% omission rate), compared to only 19 (i.e. an 8% rate) in the case of reading of the same words, and to 37 (i.e. a 15% rate) in the case of writing the content words in context. As already pointed earlier, omission of function words is a feature that has been observed in various types of language disability.

4. SUMMARY AND CONCLUSION

This paper has analysed instances of dyslexia and dysgraphia produced by 25 subjects from Class 5 to Class 8 in nine primary schools in the Sabatia sub-county of Vihiga County in Kenya. Those instances were produced from three reading tasks and three writing tasks. In either case, two tasks involved ten content words and one involved ten function words. The content words were read or written first in a list (i.e. in isolation) and then in the context of ten sentences. The aim of the paper was threefold: first, to investigate the extent to which the various symptoms characterizing the various types of dyslexia and dygraphia manifested themselves in the English of the primary school pupils under study; second, to see the extent to which the effects of dyslexia compared with those of dysgraphia; that is, more specifically, to see the degree of correlation there was between them; and third, to compare the subjects' performance on content words and function words, on the assumption that the latter would be more difficult to read and write than the former.

In relation to the expected manifestations of the symptoms of dyslexia and dysgraphia, the general picture is the following: many instances were observed of both visual errors (as a symptom of deep dyslexia) and the inability to recognize words as wholes (as a symptom of surface dyslexia

and dysgraphia) –- two phenomena that cannot be easily separated, anyway--, and there is enough evidence that (presumed) familiar words were indeed read and written more easily than less familiar ones (as a symptom of phonological dyslexia and dysgraphia). On the other hand, no semantic errors (which would have been a symptom of deep dyslexia and dysgraphia) were observed, very few instances were observed of words being replaced with those that are similar in sound (which would have been a symptom of deep dyslexia and dysgraphia), (more) irregular words did not pose greater difficulty than (less) irregular ones (which would have been a symptom of surface dyslexia and dysgraphia), and abstract words did not pose greater difficulty than concrete nouns (which would have been a symptom of deep dyslexia and dysgraphia). So, this overall picture suggests that while the present study's subjects suffered a bit of each of the three main types of dyslexia/dysgraphia, they manifested fewer types of symptoms than expected.

With regard to the degree to which the subjects' performance on reading tasks correlated with their performance on the writing ones, a strong correlation was found between the two: when a correlation test was computed on the basis of the individual subjects' scores of correct reading compared with their scores of correct spelling, the Pearson correlation coefficient (r) was found to be 0.79 at 23df at $p<0.01$, which is a high coefficient[8]. This correlation must have been highest between the reading and writing of content words in isolation, the correct performance rate for which turned to be 22% in either case. But on the parameter of context, the strong (overall) correlation cannot mask the fact that the subjects' performance was much better on reading than on writing: the respective rates are 28% vs. 19% (in the case of content words in context) and 40% vs. 29% (in the case of function words, presented only in context).

[8] An r of 0.79 gives a "coefficient of determination", corresponding to r^2 (see e.g. Brown & Rodgers 2002, p. 190) of 0.62, which means that 62% of the variance was shared by the scores for dyslexia and those for dysgraphia.

As concerns the issue of content words and function words were a greater source of difficulty, contrary to the expectations of this study, based on the long-held view (in the literature) that dyslexics encounter more problems with function words than content words, the subjects read function words (in context) better (at a rate of 40%) than they read the content words (in context) (at a rate of 28%). When this difference was subjected to a chi-square (X^2) test, it yielded a chi-square value of 45.62, which is much higher than the chi-square critical value (of 3.84) for 1df at $p<0.05$. This means the difference between the two performance rates is statistically significant.

Likewise, and once again contrary to expectations, the subjects did better on writing function words (in context), at a mean correct-spelling rate of 40%, than on writing content words (in context), at a mean rate of only 28%. These results were subjected to a chi-square test, which yielded a chi-square value of 45.62, which, too, is much higher than the 3.84 critical value for 1df at $p<0.05$, meaning that the difference between the two percentages is statistically significant.

In view of the findings of the present study summarized in the previous paragraphs, further research using a comparable set of subjects is necessary to try to understand two key observations: first, why function words were better read and written than content words. Since research reported in the literature which suggests the opposite is typically based on English (as an example) as a first language, one might envisage the possibility that dyslexia/dysgraphia in a second language does not necessarily "behave" in the same as in L1. Second, there is need to understand why fewer symptoms of both dyslexia/dysgraphia were observed than expected. While it should be not be surprising, if we refer e.g. to Field's (2004: 100) remark quoted in footnote 2, not to have observed the "clear cases of the semantic errors which characterize acquired deep dyslexia" in a study on developmental dyslexia/dysgraphia, we still need to understand why apparently only familiarity (associated with an assumed higher frequency) of the words under study was a determining factor but not the degree of irregularity in

their spelling, why it did not matter whether nouns were concrete or abstract, and why there were practically no real-word homophonous misspellings and misreading instances. Here, too, it might be speculated that the limited knowledge of English on the part of the subjects, as an L2 they had not been exposed to long enough (compared to a possible group of L1 dyslexics/dysgraphics of the same level of education) may be "to blame".

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