

## **The Effect of Spelling Errors on Written Text Production: the Case of Students with Dyslexia in Secondary Education in the Area of Pella, Greece**

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### **Abstract**

*This study had the purpose of researching and comparing the spelling errors made by students with learning disabilities, as well as by those without them. More specifically, it is investigated whether these errors affect the production of handwritten texts, how easily and quickly they are produced and generally the image of the written text from a grammatical and syntactic point of view. In order to monitor and evaluate the above questions, we used a mixture of qualitative and quantitative research. Initially, qualitative research was conducted through individual examination which included an analysis of three different kinds of students' written samples. In a second phase, the same participants were asked to fill in a questionnaire with closed questions mainly. The results demonstrated significant difficulties for students with learning difficulties, concerning the type and the number of spelling errors in a written text. These difficulties are related to their handwritten skills, visual processing of the text, issues related to the coherence and the image of the writing, the structure and organization of the strategies they use to reduce their spelling mistakes and the shortcomings in the way of being taught in school. This paper will focus on the outcomes of qualitative research.*

**Keywords:** Learning disabilities, dyslexia, language, spelling errors, vocabulary

### **1. Introduction**

Nowadays, for reasons that are still being explored and redefined, a significant proportion of the student population fails to meet the requirements of the curriculum, despite the fact that these students have normal intellectual level or even special abilities. This situation is the phenomenon of Specific Learning Disabilities, which includes dyslexia and extends to all levels of education, as a particular form of difficulty in writing, after the increase of learning and adjustment problems. This challenge is observed in many schools. Surveys show that the difficulties grow from one school level to another (Diamantopoulos, 2014). Most relate either to writing or reading and did not seem to focus on the relationship between spelling and writing. Recent studies have dealt with the speed of writing in connection with spelling errors to investigate the influence of spelling errors in the production of written speech in students with dyslexia and without dyslexia.

The results of these studies showed that the dyslexic group faced difficulties on writing due to their indecision in choosing the right graphemes and many pauses, especially within words. Considering the above research findings, and the peculiarity of the Greek language in spelling, this study attempts to investigate whether the orthographic peculiarity of the Greek language combined with the difficulties of dyslexia prevent teenage students in writing effortlessly and automatically and how they deal with it. This is an area where research is quite limited. The results of this research revealed that in the writings of students with dyslexia, the “written errors” noticed, are not expressed as “errors” in the oral domain, since the communication context and the extra-linguistic conditions cover any lack of the sentence content of the speech. Students’ short- term and working memory deficits cause difficulties in writing, which requires more speech abstraction than the oral domain. In general, free writing for students diagnosed with dyslexia is a painful process that they avoid and consider it as a psychopathic condition for them.

## **2. Theoretical framework**

### **2.1. Specific Learning Disabilities**

According to DSM-V: “Specific Learning Disorder is a developmental disorder that starts to become apparent in early school-age, but may not be recognized until later school years. It involves ongoing problems in learning essential academic skills, including reading, writing and math. However, it is not simply a consequence of lack of opportunity of learning or inadequate instruction. Key skills that may be impacted include reading of single words, reading comprehension, writing, spelling, math calculation and math problem solving. Difficulties in these skills may also cause problems in learning other academic subjects, such as history, science and social studies.

Of course, those problems are attributable to the difficulties in learning the underlying academic skills. Generally, if not treated, can potentially cause problems throughout a person’s life, including lower academic achievement, lower self-esteem, higher rates of dropping out of school, higher psychological distress and poor overall mental health, as well as higher rates of unemployment/under-employment” (American Psychiatric Association, 2013: 68, 69).

Heward (2009) reports that the causes of Specific Learning Disorders/ Dyslexia have been researched:

- a) Brain Damage: Some evidence points to the possibility that dyslexia is genetic (Pavlidis, 1981).
- b) Heredity: Researchers looking into the role of genetics in dyslexia believe that it can run in families (Galaburda, 2005).
- c) It has been found that the performance of students with learning disabilities in projects of evaluating the short-term memory is lower than that of children who do not have a problem (Pandeliadou et al., 2004; Karantzis, 1998).

### **2.2. Categories of errors**

As it is referred above, reading problems can include difficulties with reading accuracy, reading rate or fluency, and reading comprehension.

Problems with written expression can include difficulties with spelling, grammar and punctuation, and with clarity or organization of written expression. Unfortunately, many children and adolescents who suffer from this disorder experience considerable humiliation in the classroom.

According to Stasinou (2003), the characteristics of the difficulties and the errors made by the students with problems in Spelling can be classified into specific categories depending on the species (Lathiri, 2014):

#### **1. Disabilities associated with language:**

- a) Graphophonemic and Auditory Errors, in particular, these errors may have some visual resemblance to the correct spelling, but they sound differently when they are read, for example «ζβώλος» instead of «σβώλος». (Stasinou, 2003).
- b) Errors of Letter Replacement, in which the dyslexic students write words such as «κλώσσα» instead of «γλώσσα», «βολή» instead of «χολή» etc. These errors are due to problems of acoustic perception, hearing or even acoustic discrimination.

#### **2. Memory-related Disabilities:**

- a) Optical errors, that sound that are properly, but they are misspelled (Diamantopoulos, 2014).

- b) Add / Miss out Letter errors that students with phonological memory problems may find it difficult to locate the dictionary in their memory to render all the vocals (Stasinou, 2003).
- c) Serial errors, that is due to problems of organizing the correct sequence or sequencing of the letters of a word (Lathiri, 2014).
- d) Unwanted errors, which neither appear nor sounded properly (Mihailidou, 2012).

### **3. Difficulties associated with lack of attention:**

- a) They have a very bad graphic character.
- b) Often, they have difficulty of correcting their errors (Mihailidou, 2012).

### **2.3. Specific Learning Disorder in Secondary School**

As graduate students, the dyslexic students moving from Primary Education to Secondary Education are now confronted with major challenges, given the big change in the school environment and the new teaching framework. First of all, the changes that a dyslexic student experiences are happening in the knowledge level, such as comprehensive reading, misspellings, difficulties in copying and text comprehension, organizational difficulties, poor writing quality, etc (Polychronopoulou, 2012). In addition, they might experience changes in behavior and Social Relations, such as, low class social status, apathy, aggression, communication and collaboration problems with peers, low self-confidence etc.

Finally, and the most important of all, are the changes that they experience in the emotional level because of puberty. Symptoms that he/she might experience are anxiety, low self-esteem, lack of confidence, etc (Kostopoulou, 2014).

### **2.3. The oddities of Greek Language**

Greek language is a phonetic one. It consists of 24 letters, divided into 7 vowels and 17 consonants and includes 25 phonemes. It also includes digraphs, which are two vowels or two consonants together making one sound, diphthongs that is two vowels together which sound differently in one syllable. The digraphs represented by two vowels receive a mark named diaeresis (¨), placed on the second vowel (αῖ), which means that the digraphs should be pronounced separately. All the words receive an accent mark, except the monosyllabic ones (Pardali, 2002: 60).

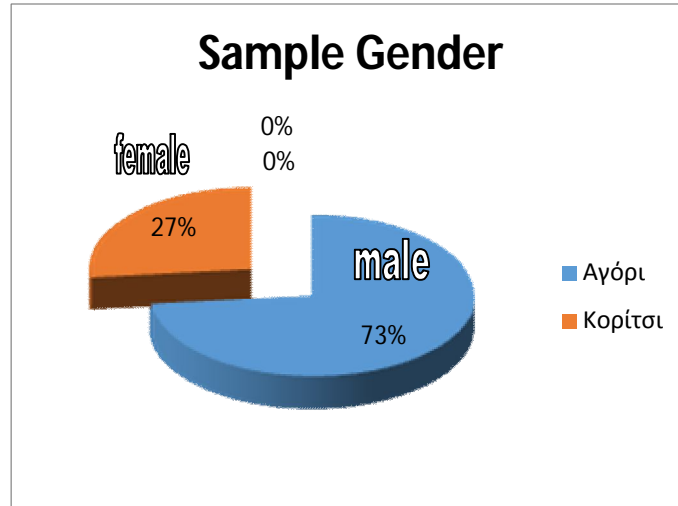
There are also combinations of two different vowels which give one sound, but, the same combination can give a different sound in other occasions, for instance: α+υ=αυ (αβ, av) or α+υ=αυ (αφ, af). That means that some letters correspond with different phonemes. Another oddity consists of the existence of the double consonants, which are pronounced like two phonemes but are represented with one letter. In addition, different letters or combinations of letters are used for the same phoneme, such as /i /, /o/, /e/,/s/ (Pardali, 2002:60). One of its main characteristics is the multi-syllabication. That means that the Greek language has few monosyllabic words and many words with two-syllables, three-syllables, four and more. In spite of the existence of few monosyllabic words, it is interesting to note that they are used quite often, on the grounds that they are grammatical words, like articles or conjunctions, which keep a significant role in the Greek language (Pardali, 2002:61).

### **3. Method**

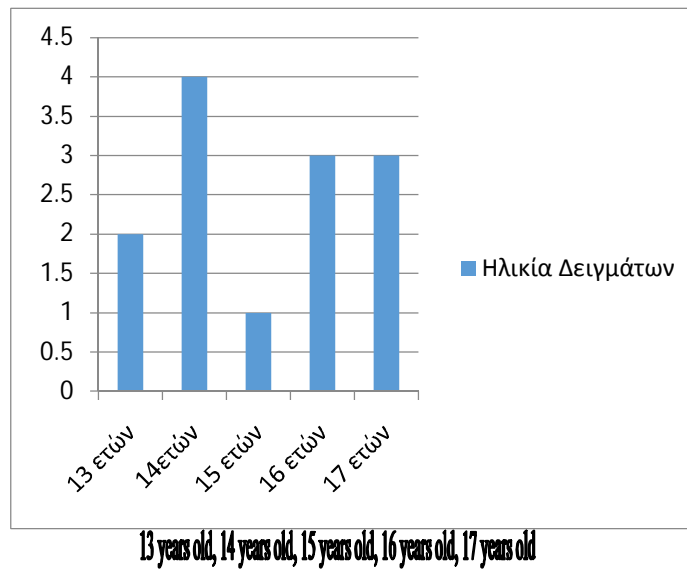
The analysis of the data was made according to both qualitative and quantitative processing (mixed method). Initially, qualitative research was conducted through individual examination which included an analysis of three different kinds of students' written samples. In a second phase students who participated in this qualitative research were asked to fill in a questionnaire with closed questions mainly. This paper will focus on the results of qualitative approach.

#### **3.1. Participants**

In the present study, research was conducted to students of Secondary Education in the area of Pella (Edessa, Greece). More specifically, the participants were high school students attending afternoon tutorials in private institutions, in order to take an extra help with their homework, in the city of Edessa. The sample consisted of 15 students diagnosed with specific learning difficulties (dyslexia) by a Greek, official organization, aged 13-17 (experimental group) and a sample number of 15 regular readers (control group), of the same age, totally 30 participants, during the school year 2016-2017.



### Sample Age in years



### 2.3. Instrument

The qualitative research was conducted through individual examination, which included an analysis of three different kinds of students' written samples. The form and selection of the written samples was based on the Detailed Assessment of Speed of Handwriting (DASH) (Barnett, et al., 2007) and previous research (Summer & al., 2014, Prunty et al., 2013, Protopapas et al., 2013, Mavroidi, 2011, Operational Program for Education and Initial Vocational Training, 2010, Pavlidis & Giannouli, 2003).

The informal spelling test included 24 correctly spelled Pseudo-words from these, two were two-syllables, five three-syllables, nine four-syllables, six four-syllables and one seven-syllable. The syllabic structure of the pseudo-words was of increasing difficulty (CVCV, CCVCV etc.) (consonants-C and vowels-V) (Diamantopoulos, 2014). In the spelling test, the assessment trials given to students were four in number, consisting of different tasks each.

In particular, the *first task* was to choose the right answer within a group of four words that were misspelled on a paper given to students. (Summer et. al. 2014; Prunty et. al., 2013). The *next task* was dictation of some words by the teachers. In the *third task* of copying some words with timing (copy best & copy fast), the words were presented on a Compaq Presario CQ62-150EV notebook, with a 17-inch screen. They were presented one after the other, in the form of increasing difficulty that is, moving from those with the fewest syllables and the simplest syllabic structure (CVCV) to the ones with the most syllables and the most difficult syllabic structure (CVCVCCVCV). They were displayed in the center of the screen, on a white background.

The words were written in lower case characters, black, in Arial font and size 44. For the purposes of this test a timer was also used. The *fourth task* was free writing in 10 minutes, without significant compositional requirements.

### **3.2. Procedure**

For the application of the instrument, the approval of the necessary authorities, in this case of the private institutions and students' parents was our priority. Firstly, it was explained to them the intention of the instrument, the characteristics of it and the utility that the collected data would have for the program and the institution. The authorities provided the data that allowed the facilitation of the application. The majority of the students agreed to participate in the present research and answer the instrument. According to the test administration some classrooms of the private institutions were allocated. The process began with the presentation of the scholar who welcomed and thanked all participants for participating. Afterwards, the objectives and importance of the study such as the reliability and privacy of the test results have been explained to the students, clarifying that the results would be reported in a generalized manner. The duration of the test was approximately an hour.

### **3.3. Statistical Analysis Procedure**

The method used for the errors analysis was Miscue Analysis, adapted to the needs of this study in the handwritten language. Miscue, in its use, examines the observed behavior of readers as an interaction between languages and thought, that is, as a process of constructing meaning from the written discourse (Goodman, 1973). After the completion of the test, the results were decoded by recording on paper and classifying students' errors in categories. In total, several codes have been studied and categorized, from which five key areas / themes have emerged:

- word copying time,
- errors in choosing the right answer within a group of misspelled words,
- errors in dictation,
- categorization of spelling errors,
- free writing

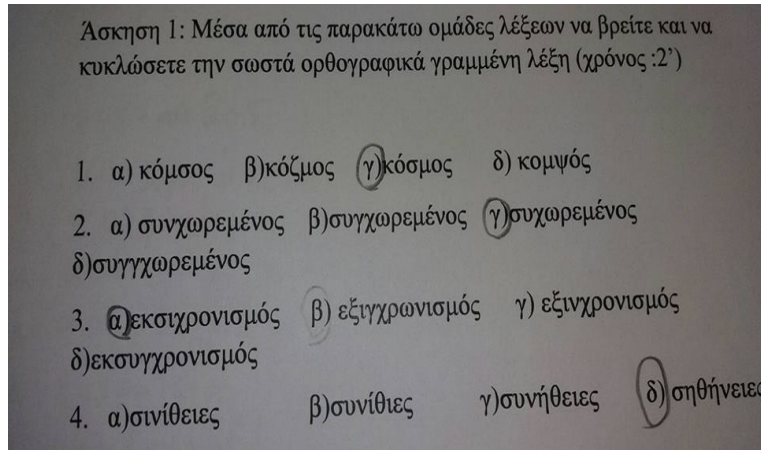
### **3. Results and discussion**

From the qualitative analysis of the data of the informal evaluation tests, provided by the 30 students of the Secondary Education 15participants of each group, experimental and control, regarding the analysis of their errors in each sector, the following results, emerged: Copying from the blackboard with timing Initially, students from both groups (experimental and control group) were asked to copy 10 words from the blackboard into a paper. The teachers were timing the students in this copying task. The table below illustrates in detail, the word copying time of the two groups from the blackboard.

**Table1: Word replication time from blackboard**

<b>Experimental group</b>	<b>Copying time</b>	vs	<b>Control group</b>	<b>Copying time</b>
Student 1	3,02		Student 1	1,28
Student 2	2,56		Student 2	1,40
Student 3	3,05		Student 3	1,40
Student 4	2,23		Student 4	1,50
Student 5	2,00		Student 5	1,35
Student 6	2,10		Student 6	1,29
Student 7	2,16		Student 7	1,25
Student 8	2,16		Student 8	1,30
Student 9	2,52		Student 9	1,28
Student 10	3,00		Student10	1,30
Student 11	2,41		Student11	1,46
Student 12	2,17		Student12	1,38
Student 13	2,35		Student13	1,30
Student	3,04		Student14	1,30
Student	2,06		Student15	1,50

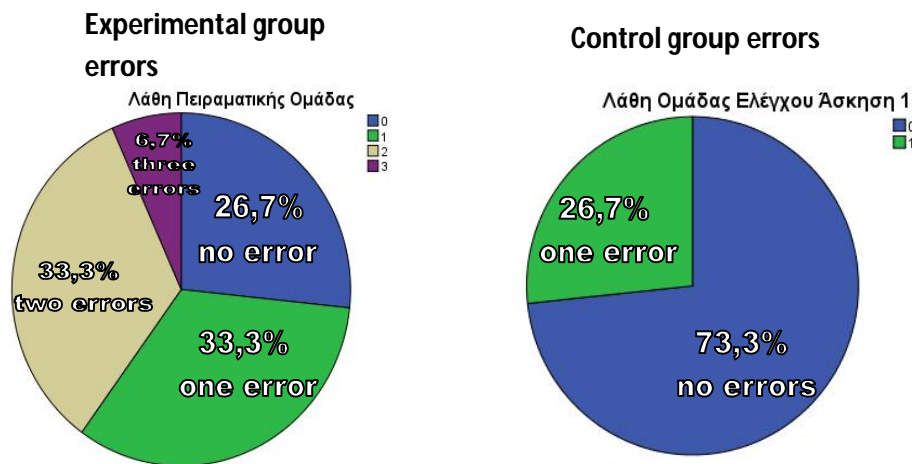
**a. Misspelling Words**



**Image: Sample of dyslexic student errors in diphthongs and in spelling**

The above image is taken from a student's sample of the experimental group. As it seems, there are a lot of similar errors in students of the experimental group, and these errors were found between the diphthongs and the spelling of the letters in these syllables. For example, many students in the word «εκσυγχρονισμός» (which means "modernization") chose the pseudo-word "εξιγχρωνισμός" not being able to realize that the -κσ- is written with two letters and they were confused with the one letter diphthong -ξ- .

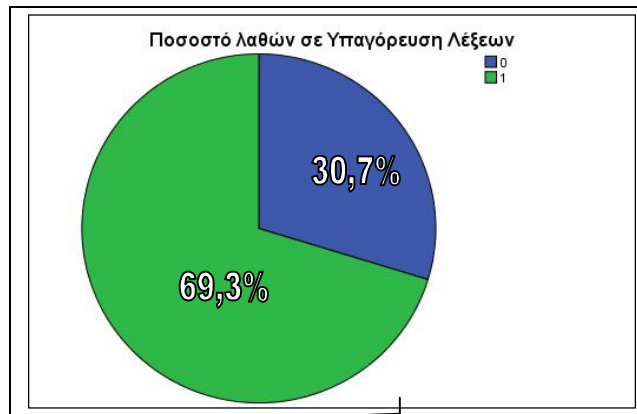
Differences in the number of spelling errors in this exercise are clearly seen by the following pies. More specifically:



**c. Errors in dictation of words**

According to the findings, the dictation of words was the biggest difference between the two groups, in terms of the number of errors.

As it is seen in the pie below the percentage of the number of errors in the experimental group, was much higher than the one's of the control group. More specifically, of the 150 words, 104 were misspelled, reaching 69.3%. On the contrary, 46 of the 150 words were correctly spelled (30.7%).



Percentage of the Experimental group’s dictation errors

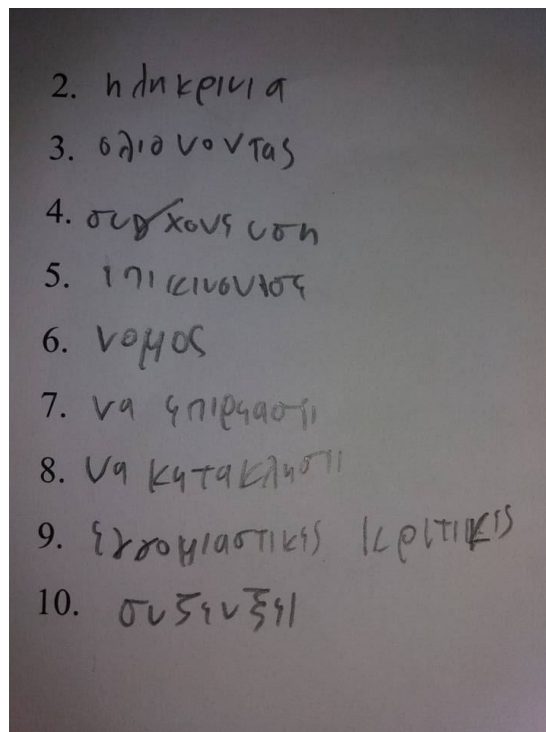


Image: Sample of dyslexic student acoustic errors

As can be seen from the above written sample of a student belonging to the experimental group, students' errors were mainly acoustic, similarity errors, errors in the use of diphthongs, absence of tones, and capitalized writing between the letters written in lower case.

d. Categories of errors in dictation and copy of the blackboard

Through the observation of the errors of the experimental and the control group it was found that the students made errors in certain specific categories. These categories were grouped, according to the frequency of the errors that occurred.

**More specifically:**

➤ Numerous errors were encountered in the first category and many times were observed two and three errors in each word. This was noticed in students' writing samples from the experimental group, especially in the writing of the two-letter vowels of the words. For example, the words "κοινωνικοποίηση" which means ("socialization"), "ειλικρίνεια" (which means "sincerity"), "επικοινωνήσε" (which means "communicate"), "να κατακλύσει" (which means "to overwhelm"), were written with many variations in many ways. It seemed that

the students did not use digraphs (two-letter) vowels, but only one-letter (η,ι,υ) for spelling, which were obviously easier to remember.

- Another type of errors, was noticed in the use of digraphs, represented by two consonants (τζ,γκ,μπ,ντ,γγ,κσ,λλ), but to a lesser extent, as the words were few in this category. For example, the words "αλλοιώνοντας" ("spoiling"), "εγκωμιαστικές κριτικές" ("praise criticism") and "συγχώνευση" ("fusion") were written in a variety of ways, as the students barked the consonants and did not know how each word was written.
- Moreover, there were errors coming from letter visual resemblance, like «γ-χ», «ζ-ξ» in the words «συγχώνευση» ("merging"), «σύζευξη» ("coupling") and «συγχωρεμένος» ("forgiven").

As far as the control group is concerned, as it has been seen from the previous section, sample errors were reduced by half (50%) according to the errors of the experimental group. In this group, it appeared that students' errors had to do with spelling rules only. They did not confuse the two-letter consonants and vowels, but they often put them in a wrong place. This is probably because they did not learn correctly the spelling rules and not because of some kind of confusion.

#### e. Free writing sample

In the last exercise of the informal test that was administered, the students had to continue/develop a sentence of the text that they had already been taught, in a paragraph, including 60-80 words within 10 minutes, stating their point of view.

In the experimental group, in all tests, the same phenomenon was observed. Their "writing sample" had a similarity to their "spoken sample". To make it clearer, there was no such a formal style that writing process demands, there were no punctuation points, and the whole writing sample seemed to be sloppy. In addition, passive voice, which gives an official style to the written discourse, was not used in any written paper.

In addition, the sentences were too long (lengthy speech), which resulted in the loss of meaning in many cases. In some cases also the period included two sentences and while the subject of the verb of the second sentence differed from that of the former, this was not stated, resulting in ambiguity and confusion.

At this point, there is also a lack of connection between the sentences and links' misuse. The image below presents a written sample of a lengthy speech, with syntactical and spelling errors of a student belonging to the experimental group and the next image is compared to a written sample of a student belonging to the control group.

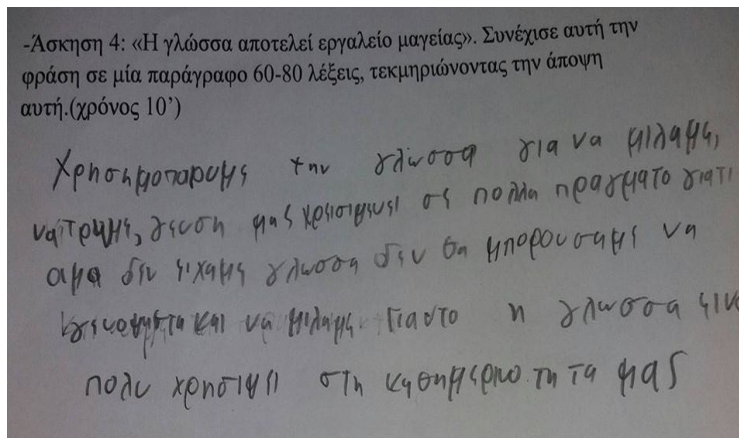


Image: Sample of free writing of a dyslexic student



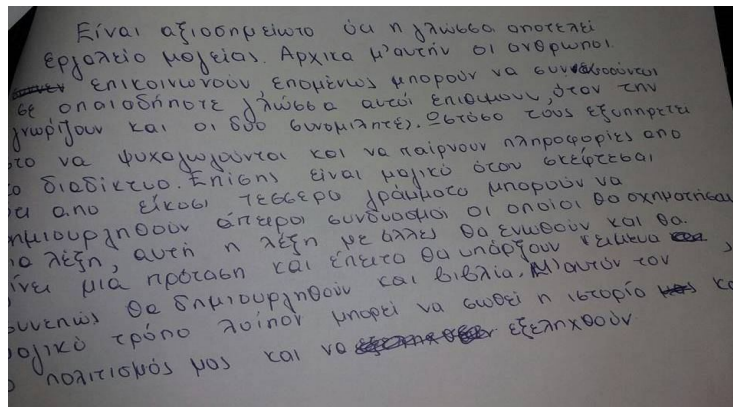


Image: Sample of free writing of a non-dyslexic student

#### 4. Conclusions of Qualitative Study

The results compared to the research questions we set out at the beginning were confirmed in many cases. Initially, and only by the proportion of gender in our sample is confirmed what we found in bibliography, that the gender ratio of dyslexic students is 4 boys: one girl (Katana & Pavlidis, 2005). Similarly, in our sample we have 15 students, 11 are boys and 4 are girls.

Initially, there appeared to be differences in word replication time between the two groups, which are also found in Goula's research (2001). The speed of reading and writing of the experimental group was surprising and unexpected, while the time that the experimental group needed was significantly higher than the one's of the control group. Moreover, it was found that there are differences between the two groups in terms of the number of errors in the task which they had to choose the correct written words. In particular, dyslexics made a higher number of errors, compared to the control group, confirming the findings of the bibliographic review.

In addition, as most of the Greek words tend to be multisyllabic, this, in combination with the emphasis points, makes more difficult the use of the dyslexics' already limited short-term memory (Pavlidis & Giannouli, 2003). This is also revealed through our study, as there were lengthy, multisyllabic words and there were much such kind of errors. What is more, dyslexic readers made many grammar errors, confusing the diphthongs, as the Greek language has many different vowel combinations, they did not use punctuation, and they could not distinguish two-letter vowels and lowercase writing. On the contrary, non-dyslexic readers made only few visual and grammatical errors.

Regarding students' free writing level, there were also differences between the two groups. In particular, dyslexics' samples of writing were lengthy, the texts were illegible, there was no logical and temporal sequence between the sentences and they could not successfully convey their meaning. Consequently, even if they have the adequate time, the appropriate means and the attention given to the execution of a project, students with specific learning difficulties usually present texts illegibly (Lerner, 2002).

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