The Effect of L2 Proficiency Level on Composing Processes of EFL Learners: Data from Keystroke Loggings, Think Alouds and Questionnaires

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INTRODUCTION

Writing in a first language (L1) is a complex and demanding process which involves many components interacting with each other in a dynamic system (e.g. Flower & Hayes, 1981; Hayes, 1996). However, writing in a second language (L2) is considered to be more difficult because L2 writers may have less developed L2 proficiency than their L1 (Grabe & Kaplan, 1996; Schoonen et al., 2003, 2011). For beginner L2 learners whose L2 is not automatized yet, writing a text can be even a much more effortful process as the attention is often directed to lower-order skills such as vocabulary, spelling and grammar. In this respect, their working memory is not free for the higher-level activities such as planning, content and organization (e.g. Chenoweth & Hayes, 2001; Lindgren, 2004; Schoonen, Snellings, Stevenson & Van Gelderen, 2009).

L2 learners must attain certain language competences before they can control the language they use in composing an L2 text. The research to date has produced conflicting evidence concerning the relationship between different L2 proficiency levels and composing processes.

*This contribution is based on a paper presented at the EARLI Sigwriting Conference in Heidelberg/Germany, 8th-10th September, 2010.

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Although the majority of studies found a positive relationship between L2 proficiency and writing performance (e.g. Chenoweth & Hayes, 2001; Cumming, 1989; Roca de Larios, Murphy & Manchón, 1999; Sasaki, 2000, 2004; Sasaki & Hirose, 1996; Whalen & Ménard, 1995), some others did not reveal such a relationship (Raimes, 1987; Zamel, 1983).

In view of these contradictory findings, we decided to investigate 1) the differences in composing processes between L1 (Turkish) and L2 (English) and 2) the effect of L2 proficiency level on the composing processes in L2. Data collected for this study consisted of keystroke loggings, think aloud protocols and responses to a post-writing questionnaire of Turkish English as a Foreign Language (EFL) high school students while performing an argumentative writing task in their L1 (Turkish) and L2 (English). A combination of the above-mentioned methods by triangulation of multiple data sources enabled us to identify the cognitive processes of students effectively during composing in L1 and L2.

THEORETHICAL AND EMPIRICAL BACKGROUND

Writing in L2

A growing amount of research into the writing processes in L2 has been carried out in the last three decades. In the comparison of processes of L1 and L2 writing, writing researchers suggest that although L2 writing students use the same kinds of cognitive processes as in their L1 (e.g. Akyel & Kamisli, 1997; Beare & Bourdages, 2007; Jones & Tetroe, 1987; Pennington & So, 1993), there are also differences (e.g. Chenoweth & Hayes, 2001; Grabe & Kaplan, 1996; Silva, 1993; Tillema, 2012; Van Weijen, 2009; Whalen & Ménard, 1995). In his meta-analysis of 73 empirical studies on L1 and L2 writing, Silva (1993) showed that L2 writers, compared to L1 writers, did less planning, less goal setting, and experienced difficulty in achieving their goals and organizing the generated ideas in L2 writing (see Silva, 1993 for a review).

Although process-oriented researchers have recently been more interested in examining EFL students' writing processes in L1 and L2, little research has been done into Turkish students' L1 and L2 (English) writing processes. In one older study, Akyel and Kamisli (1997) investigated the relationship between the L1 and L2 writing processes of 8 Turkish university students. The findings from think aloud protocols and semi-structured interviews indicated that there were more similarities than differences in L1 and L2 writing processes. Students

used similar pre-writing and general writing strategies while composing in Turkish and English except for their revision strategies. Students used more surface-level revisions such as addition and substitution strategies in their L2 writing than in L1 writing. Akyel and Kamisli's research did not include students' L2 proficiency level and their participants were all university level students.

The Role of L2 Proficiency in L2 Writing

L2 writers must have certain knowledge and competences to compose an L2 text. Among others, they must have strategic knowledge (writing strategies) to achieve the pragmatic and textual goals required by the writing task, metacognitive knowledge to control their writing processes and sufficient linguistic knowledge of the L2 (L2 proficiency) to transcribe their ideas into adequate linguistic units (Whalen & Ménard, 1995). While strategic and metacognitive knowledge may not be language specific, linguistic knowledge is language specific. It involves knowledge of vocabulary, orthography (spelling) and grammar.

While some researchers claim that general writing proficiency is more important than L2 proficiency in prediction of the L2 writing ability (Cumming, 1989; Jones & Tetroe, 1987; Schoonen et al., 2003), others argue that L2 proficiency is a major factor in explaining the L2 writing ability (e.g. Pennington & So, 1993; Sasaki, 2004; Sasaki & Hirose, 1996). For instance, some studies found that L2 proficiency did not affect the thinking and decision-making processes (Cumming, 1989), the occurrence of cognitive activities (self-instructions, goal setting, structuring, generating ideas and metacomments) (Van Weijen, Van den Bergh, Rijlaarsdam & Sanders, 2009), the formulation process (Tillema, 2012) and/or the product as writing scores during the L2 writing (Raimes, 1987; Zamel, 1983). In contrast to these studies, for instance, Sasaki and Hirose (1996) reported that L2 proficiency, L1 writing ability and meta-knowledge of L2 expository writing affect L2 writing performance. L2 proficiency accounted for 52 % of the variance in writing performance. Cumming (1989) put forward that L2 proficiency and general writing proficiency are psychologically different concepts and seem to contribute to different elements in L2 writing.

L2 proficiency is likely to play a major role in L2 writing, as students are more involved in coping with language problems while writing in L2 than in L1 (Schoonen et al., 2003). The formulation process, the central process in writing, seems to be the most influenced by writers' use of linguistic resources because this process, in which the propositional content is transformed into verbal content (Chenoweth & Hayes, 2001; Schoonen et al., 2003), depends

heavily on linguistic knowledge. Having rich linguistic resources as “lexical, morphosyntactic and orthographic knowledge” is likely to ease the formulation process (Schoonen et al., 2011, p. 33) and to turn the attentional focus of writers from lower-level activities as spelling, vocabulary and grammar into higher-level activities as rhetorical and discoursal aspects of writing (Chenoweth & Hayes, 2001; Schoonen et al., 2003; Whalen & Ménard, 1995). For instance, in Chenoweth and Hayes' (2001) study on text production in L1 (English) and L2 (French), think alouds and video-recordings of 13 university students revealed that increased linguistic experience in L2 results in more fluent L2 writing, fewer revisions and more proposed words that are accepted in the final text. Similarly, Whalen and Ménard (1995) reported that limited L2 linguistic knowledge hinders the use of planning, evaluation and revision processes at more global levels in L2 writing. In a more recent study with think alouds, Tillema (2012) found a significant effect of L2 proficiency on the planning process but not on the formulation process in L2 writing. The results also indicated that high L2 proficiency students engaged in more planning activities at the beginning of the L2 writing process than their low L2 proficiency counterparts.

In a series of studies, Roca de Larios and his colleagues investigated the relationship between L2 proficiency level (low, mid or high) and different aspects of L2 writing processes of Spanish EFL learners such as planning (Manchón & Roca de Larios, 2007), formulation process (Roca de Larios, Manchón, & Murphy, 2006), and the distribution of cognitive activities over the whole L2 writing process (Roca de Larios, Manchón, Murphy & Marin, 2008). They found the following results in those studies. High proficiency writers devoted more time to planning in the L2 task and no sign of performance loss was observed with these students (Manchón & Roca de Larios, 2007). With an increased proficiency, there might be fewer problems with lexical retrieval, thus expression of intended meaning and the students devoted less time to compensating for the lack of linguistic resources (Roca de Larios et al., 2006). High proficiency students allocated their time to writing activities in a more balanced way with more planning and evaluation and fewer metacomments than low proficiency students (Roca de Larios et al., 2008).

Keystroke Loggings in L2 Writing Process Research

The above-mentioned studies on the L2 writing process have generally used think-aloud protocols. However, only few studies have used keystroke loggings as an online method for

studying the cognitive activities in L2 writing. In an early study, Thorson (2000) compared the L1 (English) and L2 (German) writing processes of 18 American university students at two course levels (advanced or intermediate) while performing two tasks (writing a letter or an article) in both languages by using Trace-It and J-Edit as keystroke logging programs. It was found that L2 students revised more in the L2. Further analysis of two students showed that students seem to transfer their L1 writing strategies in to L2 as well as they use different strategies while composing the texts. Stevenson, Schoonen and De Glopper (2006) used think alouds as well as keystroke loggings to analyse two argumentative texts in L1 (Dutch) and L2 (English) by 22 8th grade secondary school students. The results showed that writers revise more in L2 than in L1. In addition, L2 writers' revisions were more related to the language revisions as spelling, vocabulary and grammar. In another study, Spelman Miller, Lindgren and Sullivan (2008) used keystroke loggings to examine the effect of experience in writing on the composing processes of 14 young Swedish writers in L2 (English). They focused on pauses, fluency and revisions as keystroke logging data and text quality. They found that as students' experience in writing increased, the number of pauses and time on task decreased. In a more recent study, Van Waes and Leijten (2015) compared writing fluency of 68 university student writers in L1 (Dutch) and L2 (English) by using Inputlog as a keystroke logging program. Van Waes and Leijten's main purpose was to define the fluency measures in writing process research. They proposed a new multidimensional model to measure the fluency during writing process, which focuses on four dimensions of process-related characteristics: production, process variance, revision and pausing behaviour. Concerning the results in L1 and L2 writing fluency, significant differences were found in production, process variance and revision behaviours between L1 and L2 writers, whereas pause behaviours did not differ significantly.

In an attempt to advance the research on the L2 writing process, this present study aims to provide further insights into the cross-linguistic differences between L1 and L2 composing processes and the role played by L2 proficiency level on the L2 composing processes of Turkish EFL learners. Therefore, the following research questions are addressed;

1. Are there differences between composing processes of Turkish high school students in L1 (Turkish) and L2 (English)?
2. Are there differences between composing processes of high L2 proficiency and low L2 proficiency Turkish high school students in L2 writing?

METHOD

Participants

The participants were eight Turkish high school EFL students (6 female, 2 male) aged 16-18, unlike the most studies above. They were attending Anatolian high schools in which more intensive EFL is taught than in general high schools. They were at grade 9 (n=2), grade 10 (n=3) and grade 11 (n=3). They had been learning four language skills (speaking, listening, reading and writing) in the EFL courses since grade 4 of primary school with 4 or 12 hours a week. Participants' EFL proficiency level was assessed via the Oxford Placement Grammar Test. This resulted in two groups of students; high-level proficiency (participants scoring 70, 72, 89 and 91) (n = 4) and low-level proficiency (participants scoring 44, 48, 50 and 52) (n = 4) which differed significantly ($p < .001$) according to ANOVA tests; (low L2 proficiency mean score=48,50, sd= 3,41/ high L2 proficiency mean score=80,50, sd=11,03).

Data Collection

To collect process data, we decided to use keystroke logging as well as think alouds and post-writing questionnaires because keystroke loggings provide exact data on pauses, revisions and formulation process (Leijten, Van Horenbeeck & Van Waes, this volume). Inputlog 4.0, the writing research software developed by Leijten and Van Waes (2006) at the University of Antwerpen/Belgium, was used to collect writers' keystroke loggings and mouse movements while they were composing an online text.

Data collection was realized in two sessions. Each session was carried out with an individual participant. In the first session, the L2 proficiency level test was administered to the students. Right after the language test, a think aloud training session was held on the topic of “my suggestions on learning English”. Then, as a writing task, the students were first given the L2 writing task, as we wanted to avoid translation and transfer of ideas and strategies from L1 to L2 task (Whalen & Ménard, 1995). The students were given 30 minutes to compose an argumentative text on the given topic below for the L2 (English) writing session without using a dictionary;

“You are a member of a website on 'presents'. On the website you have got a page on which you provide some information on your choices of presents. Your friends who want to buy a present for your birthday can visit your page and learn about your preferences of presents. So for your own page, write a text in which you argue why you would rather like to receive present X for your birthday than present Y. You have 30 minutes to write. Make sure your text shows a clear beginning, middle and end.”

The second session was writing the L1 text and responding to the post-writing questionnaire. The Turkish version of the L2 writing task was used as an L1 writing task as in Sasaki and Hirose (1996), who acknowledged that different topics might influence the quality and quantity of writing. As Inputlog 4.0 did not support Turkish characters (ç, ğ, ı, İ, ö, ş, ü) at the time of the experiment, the students composed the L1 texts via Inputlog by using asciified characters (letters without diacritics- c, g, i, I, o, s, u), a technique that Turkish people have to do when writing an email or sending text messages (Torunoglu & Eryigit, 2014) as some software and Web2 applications do not support Turkish characters (Adali & Eryigit, 2014). Writing the L1 text without diacritics might, to some extent, influence the writing fluency in the L1. However, we did not look at this issue in our study because of the space limitations. The think alouds were audio-recorded both in L1 and L2 writing sessions. After the completion of the writing tasks, a post-writing questionnaire (adapted from Akyel & Kamisli, 1997) was used to interview the students on their L2 composing process. This was a semi-structured questionnaire consisting of questions in English that are related to the students' L2 writing strategies as well as their perceptions about writing.

Data Analysis

In the data analysis, firstly, we used five kinds of keystroke logging data; total composing process time, number of words and characters produced, pauses and revisions. We conducted Revision Analysis, Pause Analysis and Text Analysis to generate these output variables based on .idf log file in Inputlog. The number of revisions, means and standard deviations are provided in the XML file in Revision Analysis. The number of revisions refers to the number of revisions made by writers when they deleted or inserted a character (a letter) into the text. That is to say, revisions signify all the deletions and insertions of the characters made to the text during the composing process. We did not differentiate between deletions and insertions. An example of deletion and insertion of a character/characters can be seen in the linear

logging file of a high L2 proficiency student (Figure 1). For instance, when the writer recognized that she misspelt the word "carefully" in the first line, she deleted the "er". Furthermore, in the third line, as an example of insertion, she recognized that "meanful" is not the correct word and inserted "ing".

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so·you·must·{33057}use[BS3]{2777}use·your·money·carre[BS2]efully·[BS].
·{104505} if·i·must·to·say·clearly·i·dont·expect·big·{2605}presents·i·{2059}just
·expect·{19126}[Movement][LeftButton][Movement]but ·i[RIGHT8]meanful·presents.
{13884}[Movement][LeftButton][Movement]ing[Movement][LeftButton][Movement]
{3526}[Movement][LeftButton][Movement][RightButton][Movement][LeftButton]
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Figure 1. The linear logging file of a high L2 proficiency student in Inputlog

Similarly, we performed a Pause Analysis to extract the number of pauses. The number of pauses is the pauses realized when writers interrupted writing for more than 2000 milliseconds (threshold level). We chose 2000 milliseconds as a pause threshold level because this duration is convenient to capture the high-level cognitive processes such as planning, formulation, revision etc during the composing process, which are involved in our main research purpose. In addition, it is the most used threshold level in writing research to define the pauses during the writing process (Van Waes & Leijten, 2015), which allows comparison of our study with other studies that used 2000 milliseconds as a pause threshold level (Kowal, 2014; Palviainen, Kalaja & Mäntylä, 2012; Spelman Miller, Lindgren & Sullivan, 2008). A Text Analysis was also performed to extract “composing process time” and “number of words ¹ produced” which were used to compute the writing fluency in both languages. Total composing process time is the time from when Inputlog program starts to register the composing until we stop recording. The number of words produced refers to the total number of words produced (including the deleted ones) during the composing process time (see Leijten & Van Waes, 2006; Van Waes & Leijten, 2015 for detailed information)². Finally, writing fluency in the L1 and L2 was measured by the words and characters written per minute. We calculated it manually by dividing the total number of words and characters by the composing process time. We performed descriptive statistical tests on SPSS. We also took into account the graphical representations of students' online composing processes to interpret the writing fluency. These are automatically generated graphs by Inputlog, based on LS graph of Lindgren and Sullivan (2002) and Geographical Information System (GIS)

(Lindgren, Sullivan, Lindgren & Spelman Miller, 2007) to enable visualizing the online composing processes of low and high L2 proficiency students in L1 and L2 writing.

Secondly, the think aloud data were transcribed, segmented and analysed in terms of frequency (i.e. the number of occurrences) of composing processes based on the coding scheme of Roca de Larios et al. (2008); 1. *Reading the prompt*, 2. *Task conceptualization*, 3. *Planning*, 4. *Formulation*, 5. *Evaluation*, 6. *Revision*, 7. *Metacomments*, 8. *Lexical search* (we incorporated it into the coding scheme as it was recognized as a frequent operation in transcriptions). Two raters coded the randomly selected transcribed protocols of one L1 and L2 text. The intercoder reliability was very high (Cronbach's alpha= .96). In the data analysis of think aloud data, we confined ourselves to the mean scores and standard deviation of occurrences rather than the significance testing as the sample was too small (n=8).

Thirdly, the students' responses to the questionnaire were analysed and used as qualitative data to help us interpret and cross-validate the findings from think aloud protocols and the keystroke logging data.

RESULTS

The keystroke logging (Inputlog) data

With respect to the first research question, the results of keystroke logging data indicate that EFL students' L2 composing processes are different from L1 composing processes in argumentative text production. Students devoted more time to the formulation processes in the L2 than in the L1 writing task. Both groups of students composed their L2 texts in almost twice as much time as the L1 text, as can be seen in Table 1. They produced more words in the final L2 text than in the L1 text. As a result of calculating the writing fluency, we found that EFL students wrote more fluently in L1 than in L2. Related to the pauses during text production, EFL students paused twice as much in the L2 compared to the L1. Similarly, they made twice as many revisions while composing in the L2 as in the L1.

Table 1

Mean occurrences of L1 and L2 composing processes (Inputlog data)

	<u>L1 (Turkish)</u>	<u>L2 (English)</u>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Composing process time (in min)	7.67 (2)	15.30 (8.60)
N° of total words	109 (35)	164 (50)
N° of words per minute	13.88 (3.03)	10.03 (4.8)
N° of characters per minute	94.80 (25)	48.42 (14.96)
N° of pauses	29 (10)	68 (44)
N° of revisions	17 (21)	49 (55)

Standard deviations are in brackets (*SD*)

Concerning the second research question, it was found that there are differences in mean frequencies of composing processes of high proficiency and low proficiency students in L2 writing. Low L2 proficiency students spent more time on composing the L2 text than high proficiency students (Table 2).

Table 2

Mean occurrences of L2 composing processes by high and low L2 proficiency students (Inputlog data)

	<u>Low L2 Prof</u>	<u>High L2 Prof</u>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Composing process time (in min)	18.16 (8.60)	13.86 (2.5)
N° of total words	137 (40)	192 (47)
N° of words per minute	6.45 (1.53)	13.61 (4.30)
N° of characters per minute	38.03 (5.47)	57.28 (14.31)
N° of pauses	85 (44)	60 (10)
N° of revisions	71 (55)	38 (21)

Standard deviations are in brackets (*SD*)

However, high L2 proficiency students produced more numbers of words than low L2 proficiency students. High L2 proficiency students tended to compose their L2 texts in a shorter period of time than low L2 proficiency students. We found that high proficiency students (mean=13.61 words per minute) wrote twice as fluently as compared to the low proficiency students (mean=6.45 words per minute). Low proficiency students paused more than high proficiency students. Finally, low proficiency students' revisions (deletions and editions) were more frequent than high proficiency students in L2 task.

The Inputlog graphs in figures 2, 3, 4 and 5 show the visual representations of online L1 and L2 writing processes of different high and low L2 proficiency students (Leijten & Van Waes, 2013; Lindgren & Sullivan, 2002). As can be seen in the figures, there were variations between and within writers (Kowal, 2014). The graphs show the number of characters produced and deleted each time, the cursor position and pauses longer than a predefined threshold value (2000 milliseconds). The x axis represents the process time (in seconds) and the y axis represents the number of characters formulated and left in the final text. The wide field shows the distance between the ideas proposed (upper-line) and accepted (below the field) in the final text. The circles below the field represent the pauses. The bigger the circle is, the longer the writer pauses. When there is a sudden drop of line, this means that a number of characters was deleted in the text (Van Waes, Leijten & Van Weijen, 2009).

As can be seen in these figures, in L1 writing, the writers did not pause and revise (insertions or deletions) as frequently as in L2 writing. The Inputlog graphics 2 and 3 show that high and low L2 proficiency students' composing processes do not differ much in L1 writing, an issue that we do not deal with in this study but in another study (Tiryakioglu, Sercu & Verschaffel, 2010).

Figure 2. A graphical representation of a high L2 proficiency writer's L1 composing process

Figure 3. A graphical representation of a low L2 proficiency writer's L1 composing process

In comparison of low and high L2 proficiency students' writing processes, the high proficiency student wrote the L1 text and L2 text in a more linear way (Figure 4) and more fluently than the low L2 level student (Figure 3). The writing fluency is observed in the narrowness of the field which indicates that the ideas generated were reflected in the written texts. However, this was not true for the low-level student, who had a less fluent writing process (Figure 5). In Inputlog graph, circles indicate that the writer paused more than the threshold level (Leijten & Van Waes, 2006). The regular distribution of circles in high proficiency student's writing process shows that she paused at regular intervals throughout the process. She planned, generated ideas and the text, evaluated and revised systematically and recursively. Figure 2, 3 and 4 show that the pauses occurred throughout the whole composing process. However, low-level writer's pauses in L2 writing especially intensified in the middle of the composing process, which indicates that she was struggling with formulation of the text (Figure 5). She paused more, revised more and coped with planning and transcription of what had been generated (wide field).

Figure 4. A graphical representation of a high L2 proficiency writer's L2 composing process

Figure 5. A graphical representation of a low L2 proficiency writer's L2 composing process

The think aloud data

Concerning the first research question, the results of the think aloud data demonstrate that the occurrences of L2 composing processes were found to be more frequent than the occurrences of L1 composing processes (Table 3). Both high and low-level participants' occurrences of L2 composing processes are more than L1 composing processes.

Table 3

Mean occurrences of L1 and L2 composing processes (think aloud data)

	<u>L1 (Turkish)</u>	<u>L2 (English)</u>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Reading the task	1.00 (.00)	2.13 (.64)
Task Representation	2.00 (.92)	2.38 (1.30)
Planning	4.00 (2.20)	4.50 (2.82)
Formulation	14.25 (4.26)	26.00 (8.36)

Evaluation	2.50 (1.51)	6.50 (3.11)
Revision	1.38 (.91)	3.63 (1.99)
Metacomments	1.25 (1.03)	5.75 (4.80)
Lexical Search	.00 (.00)	5.38 (3.02)

Standard deviations are in brackets (*SD*)

Regarding the second research question, the results of the think aloud data demonstrate that high L2 level participants' occurrences of L2 composing processes were found to be more frequent than those of low-level students, except for reading the task and lexical search (Table 4). High proficiency students formulated more in composing the L2 task than low proficiency students. The low proficiency group also spent more time reading the task than high proficiency students. Low-level students employed twice as many lexical search operations in L2 writing as high-level students.

Table 4

Mean occurrences of L2 composing processes according to L2 proficiency levels

	<u>Low L2 Prof</u>	<u>High L2 Prof</u>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>
Reading the task	2.50 (.57)	1.75 (.50)
Task Representation	1.75 (.95)	3.00 (1.41)
Planning	4.00 (3.36)	5.00 (2.58)
Formulation	21.25 (4.34)	30.75 (9.17)
Evaluation	6.00 (3.46)	7.00 (3.16)
Revision	3.50 (1.91)	3.75 (2.36)
Metacomments	5.50 (6.45)	6.00 (3.46)
Lexical Search	7.25 (2.87)	3.50 (1.91)

Standard deviations are in brackets (*SD*)

Below is an extract of a think aloud protocol of a low proficiency writer who was struggling to generate ideas in L2. The underlined parts in the excerpt are the words in the final text.

We included English translation of Turkish think alouds in square brackets; others are rereadings, metacomments or idea-generation in English.

“I want a ... [*what should I say?*] I don't want a book.. because ... a computer game because it is very enjoying .. I like.. [*Does 'enjoying' mean enjoyable? What if I say the game makes me happy? How will I say? I will say I like*] computer game. Computer game is relax to me.” (a low L2 proficiency writer-L2 test score=50)

The low proficiency writer proposed two ideas on computer games but he was not able to verbalize his ideas into English because of a lack of adequate vocabulary and grammatical knowledge. Then, he avoided including these ideas and wrote another idea that he thought he could express better. He formulated very simple sentences which contained a number of grammatical errors, being a common characteristic observed among low-level writers.

Below is a high proficiency student's think aloud protocol which demonstrates that she is concerned with the global planning, the audience, the style of the text, the content and organization of the text.

“Hi everyone. This Monday is my 17th birthday. [*As it is such a piece of writing in the style of my website, I am writing as if I was talking with everyone on my website, but let's see how it will happen*]. Of course i want some presents. ... You are free to choose the category. You can find a legendary present for me or you can find a little surprise too...[*I will say I prefer this and that.*] I prefer...” (a high L2 proficiency writer-L2 test score=72)

Think aloud protocols of high L2 proficiency students showed that they were more concerned with rhetorical problems in construction of meaning in their texts while low L2 proficiency students' protocols lacked these rhetorical concerns. They sometimes had to look for the appropriate words.

Responses to the post-writing questionnaire

Students' responses to the post-writing questionnaire were analysed qualitatively. Regarding the question “what they did before starting writing”, five of the eight students reported that they made an overall plan of the text (advanced planners). Three of the eight did not make a plan, but wrote what came to their minds (emergent planners).

As a response to the question “what they did while writing”, most students reported that they tried to remember the vocabulary, spelling of them and the sentence combination to give meaning to the text.

As for the question “what they thought when they paused”, most students reported that they stopped to think about the words, to check for the spelling and to think how to make grammatically correct sentences.

As for their responses to “what they found difficult while writing”, both high and low proficiency students reported that they experienced difficulty, to a certain extent, with finding appropriate vocabulary to express their intended meaning, but only low proficiency students reported that they found it difficult to make grammatically correct sentences.

Regarding the question “what they did when they just finished writing”, all students reported that they went back to beginning of the composition, revised and made necessary changes. This behaviour on revisions and making changes can be visualized in the Inputlog graph as a drop of dotted-line at the end of the composing processes (Figure 2, 3, and 4).

Regarding the question “in which language, L1 or L2, did you think while composing?”, all high L2 proficiency writers reported that they thought in L2 while writing, but all low L2 proficiency writers thought first in L1 then they translated their ideas into English before transcribing the sentences.

DISCUSSION AND CONCLUSIONS

Comparison of L1 and L2 Composing Processes

Our results concerning the first question seem to corroborate previous findings that there are significant differences between EFL students' L1 and L2 composing processes in writing an argumentative text. L2 writers compose an L2 text less fluently than an L1 text (Breuer, this volume). That is to say, they produce fewer words per minute while composing an L2 text than an L1 text (Chenoweth & Hayes, 2001; Lindgren, Sullivan, & Spelman Miller, 2008; Sasaki & Hirose, 1996; Schoonen et al., 2009; Silva, 1993; Van Waes & Leijten, 2015). L2 writers pause more frequently in L2 writing to evaluate the proposed ideas, translate them into linguistic units and transcribe the words into the text written-so-far than in L1 writing. Their revisions (deletions and insertions) take place more often in L2 writing than in L1 (Stevenson, Schoonen & De Glopper, 2006; Thorson, 2000). This could be explained by the

fact that while writing an L2 text, students have to make a bigger effort to express their ideas (Sasaki, 2000) as the L2 composing process is more difficult than the one in their L1 (Schoonen et al., 2003, 2009, 2011; Silva, 1993). It seems that the writers' aim in L2 writing is to express their own ideas and their intended meaning by using correct vocabulary and grammatical patterns (Manchón, 2016; Whalen & Ménard, 1995); however, in L1 writing, the writers' aim is to communicate their ideas to the target audience.

Our findings are in line with Akyel and Kamisli's (1997) findings that EFL students tend to be mainly concerned with searching for vocabulary and/or checking for grammar while composing the L2 text. L2 writers face word-related problems (e.g. Cumming, 1989) and syntactic difficulty (Schoonen et al., 2003). They tried to detect whether the sentence does or does not conform to the grammatical rules of the language. In general, limited linguistic knowledge in L2 led the L2 writers to try to express their intended meaning by replacing another word or by changing their intention of meaning.

Composing Processes of High and Low L2 Proficiency Students

Our findings concerning the second research question indicate that there is a relationship between L2 proficiency level and composing processes in L2. They seem to confirm the findings evidenced in previous research (Chenoweth & Hayes, 2001; Lindgren, Sullivan, & Spelman Miller, 2008; Palviainen, Kalaja & Mäntylä, 2012; Spelman Miller et al., 2008) that increased experience with the language brings increased fluency in writing. What is more, if the L2 linguistic experience of the student increases, more cognitive resources are allocated to the other aspects of writing rather than the surface level aspects. As a result, the formulation process is performed more efficiently when a learner is more proficient in that language. An increase in language proficiency results in better expression of meaning. Accordingly, our high proficiency writers seem to benefit from their linguistic knowledge in writing the L2 text. Accessibility to linguistic resources enables them to plan more, generate text more fluently and pay attention to rhetorical conventions in L2 writing. Graphical representations generated automatically by Inputlog have given us insights about the visualisation of writers' composing process (Leijten & Van Waes, 2006; Lindgren & Sullivan, 2002; Lindgren et al., 2007; Van Waes & Leijten, 2011), especially of the fluency of the process. As high proficiency writers have the necessary linguistic knowledge for the

language at stake, they organize and use their writing processes effectively and strategically in L2 writing (Roca de Larios et al., 2006).

In contrast to the high L2 proficiency students, the results seem to demonstrate that the low L2 proficiency writers compose an L2 writing text less fluently. They formulate fewer words in a longer period of time than their high proficiency peers. In addition, findings related to word-search operations among low-level students show that they devote much attention to the linguistic concerns and compensatory problems as in Manchón and Larios (2007). Our results related to less writing fluency and word-search operations among low-level writers seem to imply that L2 writing places high demands on students' attentional capacity and this cognitive overload can prevent low-level L2 writers from creating ideas they feel satisfied with, finding the appropriate vocabulary and grammar to express their ideas and organizing the text (Chenoweth & Hayes, 2001; Pennington & So, 1993). In other words, lack of linguistic knowledge seems to constrain the students' expression of meaning and high-level processes in L2 writing (Chenoweth & Hayes, 2001; Whalen & Ménard, 1995). It was observed in think aloud protocols that at times they even give up expressing their intended meaning. When low-level students are faced with a difficult writing task, they employ some strategies such as relying on L1 and/or deciding to change their message (Elbow, 1973, cited in Chenoweth & Hayes, 2001). In most of their pause time, they dealt with evaluation of the previously written text especially by deleting and inserting characters and words as observed in keystroke loggings; thus, they did not start to write the next sentence. As seen in the Inputlog graphs, the ideas planned and generated are not reflected in their final texts as also found in think aloud data and responses to post writing questionnaire in that L2 writers lacked the necessary knowledge of vocabulary, spelling and grammar to express their intended meaning. As the research suggests (Chenoweth & Hayes, 2001; Kowal, 2014; Schoonen et al., 2011), they may not have proceduralized and automatized their L2 knowledge yet. Consequently, limited linguistic knowledge might have inhibited low-level students' processes of generating ideas, thus loss of performance was observed while they performed L2 writing tasks (Roca de Larios et al., 1999), which seems to influence the writing process and thus organization of cognitive processes efficiently while writing.

To conclude, the specificity of our results in terms of L1 and L2 writing is that we were able to obtain results and shed light on the differences on the one hand between L1 (Turkish) and L2 (English) composing processes of high school EFL students and on the other hand between low and high L2 proficiency writers' L2 composing processes. In our research,

along with the keystroke loggings which provided us accurate writing process data, we opted for think aloud protocols to reach what the writers actually think while composing and a post-writing questionnaire to obtain their self-reflections and perceptions of their L1 and L2 writing strategies. However, as a limitation to this pilot study, we did not succeed yet to realize a systematic integration of data coming from all these different sources, which is left as an issue to be studied as further research. Furthermore, future studies into learners' composing processes could be performed with more participants and multiple writing tasks in different genres to unravel both the cognitive and linguistic dimension of L2 writing (Manchón, 2016). Moreover, the students' texts could be analyzed to determine the relationship between L2 proficiency level, composing processes and text quality. By this way, we would be able to understand how L2 proficiency level can influence the text quality in L2 writing.

Pedagogical Implications

As to pedagogical implications, research on composing processes suggest that writing instruction should focus on students' planning, information-gathering, formulation, revision and editing of the texts (Raimes, 1991). Our findings suggest that higher L2 proficiency level students may profit from an intervention, involving explicit instruction of revision and editing strategies and rhetorical aspects of writing. Unskilled L2 writers, who generally may fail to use writing strategies while composing, could be taught how to implement them (Sasaki, 2000). In this respect, for low proficiency level students, sentence-building and combining strategies, vocabulary use strategies could be taught as well as the composing process as a whole could be modelled to make them aware of the writing process.

Notes:

1. Inputlog also counts the number of words along with the typed characters. The difference between the use of words and characters is larger when the number of characters (excluding spaces) is taken into account compared to the number of words (Van Waes & Leijten, 2015). However, in our research we did not test the significance level because of the limited number of participants. We also wanted to look at the number of words a student can write per minute. Because this gives us more precise information about the text production at product (text) level and a view

of comparability to the other research papers in which number of words per minute was used as a fluency measure (e.g. Chenoweth & Hayes, 2001; Ellis & Yuan, 2004).

2. In Turkish, the "word" is "a meaningful unit that is composed of one or more morphemes" (Dictionary of Turkish Language Association), which is similar to the meaning of "word" in English, which is described as "a single unit of language which means something and can be spoken or written" (Oxford Learners Dictionary). Thus, the meaning of word in Turkish is not different from the one in English. In Turkish language, there are also compound words, which are written jointly or separately according to the syntactic rules. Here in this chapter, we did not look at the issue of compounding in text production. Anyway, we checked the students' texts in the data to count the number of the compound words. Only four compound words have been found in the total words (876 words) written during the composing process time by eight participants. Therefore, the proportion of compound use to the total numbers of the words in eight texts in L1 (Turkish) writing is 0.45 %.

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