

Learners' processes during pre-task planning and Working Memory Capacity

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Abstract

The present study is part of a larger scale research (Guará-Tavares, 2011, 2013) that investigates the relationship among working memory capacity, pre-task planning, and L2 speech performance. The aim of the study was to analyze 1) what processes learners engage during pre-task planning, and 2) whether higher and lower working memory spans engage in different processes during pre-task planning. Learners' processes were accessed by means of think aloud protocols and a retrospective interview. Working memory capacity was measured by the Speaking Span Test. Results show that learners engage mainly in organization of ideas, rehearsal, lexical searches, and monitoring. Moreover, higher spans employ significantly more metacognitive strategies during planning when compared to lower spans.

Key words: Pre-task Planning; Learners' Processes; Working Memory Capacity

Introduction

Over the last decades there has been a substantial body of research¹ on tasks (Ellis, 2005). Within the study of tasks, one construct which has attracted considerable attention is pre-task *planning*.² Pre-task planning is originally a type of activity which belongs to the pre-task stage in Skehan's (1996) framework to task-based instruction. However, according to Ortega (2005), planning seems to have evolved into an area of inquiry in its own right and "has become a burgeoning area of investigation within task-based learning" (Ortega, 2005, p. 77).

Researchers have investigated planning from a variety of perspectives, including the different types of planning (Foster & Skehan, 1996); different amounts of planning time (Mehnert, 1998); planning and different task types (Foster & Skehan, 1996), planning and levels of proficiency (Kawauchi, 2005), planning and working memory capacity (Guará-Tavares, 2011, 2013).

Research has shown a positive impact of planning on L2 performance. Studies have shown that planning leads to gains in fluency (Mehnert, 1998; Ortega, 1999); accuracy, although results have been more mixed in this respect (Ellis, 1987; Mehnert, 1998; Ortega, 1999); and complexity (Foster & Skehan, 1996; Mehnert, 1998; Ortega, 1999; Guará-Tavares, 2011). In general, studies show that the benefits of planning do not take place simultaneously for fluency, accuracy and complexity, and researchers explain that in terms of attentional tradeoffs.

One area of research within pre-task planning which merits further scrutiny concerns the processes learners engage during planning. Ortega (1999, 2005) states that most studies on pre-task planning take a *product-oriented* approach which focuses on the *impact* of planning on L2 performance. Thus, she claims for a more *process-product oriented* approach in the attempt to reveal where the benefits of planning come from.

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That is to say, she claims for a focus on the processes learners engage during planning that help performance.

Pre-task planning is a means to help learners' overcome limitations in attentional resources and improve L2 performance, it is a problem solving activity (Ellis, 2005), and it seems to assist performance; by triggering a range of strategic, metalinguistic and metacognitive behaviors (Ortega, 2005). It seems reasonable to argue that one's ability to engage in strategic behaviors successfully may to some extent explain benefits of pre-task planning on L2 performance.

Planning is a problem solving activity, and according to Hambrick and Engle (2003), a problem is a goal which is not instantaneously achievable and whose most prominent feature is that although the initial state and the target are clear, how to convert the initial state into the target state is uncertain. The authors (2003) claim that problem solving activities require "the ability to maintain goals, action plans, and other task-relevant information in a highly activated and accessible state, and when necessary, to inhibit activation of irrelevant or distracting information" (p. 179). Thus, individual differences in working memory capacity may play a role in how well one engages in problem solving activities. Research has shown that individuals with higher working memory capacity tend to be more strategic (McNamara & Scott, 2001); thus, individual differences in working memory capacity may reflect differences on how successful one is in planning a task.

The present study sets out to examine 1) what processes learners engage during pre-task planning and 2) whether higher and lower working memory individuals differ in the processes they engage during pre-task planning.

1. Review of the literature

1.1 Working Memory

Engle et al (1999) view working memory as a cognitive system comprising (1) a store in the form of long-term memory traces active above a threshold, (2) processes for achieving and maintaining this activation, and (3) controlled attention. Nevertheless, when they

refer to working memory *capacity*, it is the limited capacity of the element of *controlled attention* that is being referred to.

More specifically, for Engle and his associates the term *working memory capacity* refers to "attentional processes that maintain task-relevant information activated in an accessible state, or to retrieve that information under conditions of interference, conflict, and competition" (Kane, Conway, Hambrick, & Engle, 2003, p.23). When referring to working memory *capacity*, Engle and his collaborators mean the limited capacity of the mechanism that Baddeley and Hitch (1974), Baddeley and Logie (1999) have called central executive.

According to Engle et al. (1999, p. 104), "working memory is not about storage or memory per se, but about the capacity for controlled sustained attention in the face of interference" (emphasis in the original). They view the nature of working memory limitations in terms of the capacity for controlled attention, which will emerge in situations that require controlled processing.

In a controlled processing activity, it is attention that is controlled and the cognitive mechanisms that encompass a controlled processing activity include activation, suppression, serial search and retrieval, and monitoring (Engle, Kane & Tuholsky, 1999). In other words, individual differences in working memory capacity reflect differences in the capacity for sustaining, maintaining and shifting attention among the various aspects of task performance (e.g. activation, suppression, monitoring), which also leads to differences in the ability to maintain and to inhibit activation of irrelevant information.

In the present study, I take Engle's attentional view of working memory; thus, when I refer to individual differences in working memory, I mean that learners may differ in the capacity for sustaining, maintaining, and shifting attention, and the ability to maintain and to inhibit activation during the planning of an oral task.

1.2 L2 Speech production and Pre-task planning

Levelt's (1989) model of L1 speech production has four specialized components, which underlie speech

production: the conceptualizer, the formulator, the articulator, and the speech comprehension system. These components work in a highly automatic way, and automaticity is what allows the components to work in parallel, which is, in turn, “a main condition for the production of uninterrupted speech” Levelt (1989, p. 2).

De Bot (1992) made a few adaptations to Levelt’s (1989) model in order to account for L2 speech production. The first assumption of De Bot’s (1992) model is that the speaker has, first of all, to decide what language to speak. This decision takes place in the conceptualizer. As far as the formulator is concerned, De Bot (1992) proposes that it is language-specific; thus, different procedures are applied to the grammatical encoding of L1 and L2 speech. Finally, De Bot (1992) suggests only one articulator for both languages. By assuming only one articulator L1 interferences in L2 can be explained.

D’Ely (2006) argues that although planning is essentially a cognitive process which is inherent to the act of speaking, it evolves into a metacognitive process when it is used strategically by the learner. Therefore, D’Ely (2006) defines strategic planning as a problem-solving activity that provides learners the opportunity “to exert some control over what they know towards achieving gains in performance” (p. 17).

As mentioned in the introduction, planning has been investigated from a variety of perspectives (Sangarun, 2005; Mehnert, 1998; Guar-Tavares, 2011). For the purposes of this review of the literature, the studies that will be reviewed here are Ortega (1999) and Ortega (2005), for they were the first ones to take a *process-oriented* approach towards planning, which is the focus of this study.

Ortega (1999) investigated the impact of planning on L2 performance and also focused on the processes learners engage during planning by checking whether learners focused on form. Immediately after the production task, retrospective semi guided interviews were used in order to document what learners did when they planned their speech. Results from learners’ performance and interviews indicated that planning time may lead learners to focus on form and produce more fluent and complex language.

In her 1999 study, after concluding that learners focused on form, Ortega (2005) went further on her investigation of learners’ processes during pre-task planning by scrutinizing what strategies learners employed during planning that assist performance. In other words, she aimed at categorizing learners’ strategies during planning.

A variety of strategies, metacognitive (advanced planning, performance evaluation, production monitoring) and cognitive (writing for retrieval, avoidance, translating) were reported by the learners. Overall, the most frequent strategies were writing, outlining, summarizing, production monitoring, organizational planning, and lexical compensation, translating, emphasizing with the learners, and rehearsing. These strategies highlight the high frequency of retrieval and rehearsal operations within strategic planning (Ortega, 2005).

During planning, Ortega (2005) argues, “learners engage in solving form-in-meaning problems” (p. 106). She distinguishes two positions towards the dichotomization of form and meaning. According to her, Skehan and Foster (2001) and VanPatten (2002) emphasize the dichotomization between form and meaning by drawing on *limited* capacity theories of attention. In other words, because attentional resources are limited, individuals do not focus on form and meaning simultaneously.

On the other hand, she states that Dekeyser et al. (2002), drawing on *unlimited* capacity theories of attention, claim that the dissociation between meaning and form is impossible, and attention to both is clearly possible. In other words, since form and meaning are inseparable, attention to both is possible and in line with unlimited capacity theories of attention. In this sense, Ortega (2005) advocates the need to challenge the dichotomization of form and meaning.

1.3 The framework of O’Malley and Chamot (1990)

Following Ortega (2005), I will adopt the framework of strategies by O’Malley & Chamot (1990). Strategies are “ways of processing information that

enhance comprehension, learning, use or retention of the information” (O’Malley & Chamot (1990, p. 1). In their framework, strategies can be divided in three main categories: metacognitive strategies, cognitive strategies, and socio-affective strategies.

Metacognitive strategies require planning, thinking of a task as it takes place, monitoring one’s production or comprehension and evaluating performance or learning after an activity is completed (O’ Malley & Chamot, 1990). Examples of metacognitive strategies are organizational planning, problem identification, monitoring, evaluation, selective attention, and rehearsal. Following O’ Malley and Chamot (1990), the following metacognitive strategies were defined:

1. *Organizational planning* concerns the planning of parts, sequence, and main ideas to be expressed. In the present study, it included overall organization carried out before the actual planning of oral performance started. It included sequencing the pictures, making sense of the pictures, defining a main idea for the content of the story and so on;
2. *Problem identification* concerns awareness of a problem to be solved, which may not be restricted to language problems but also when learners had doubts on what to do in general such as which picture should be the beginning or the end of the story, what they should do if they forget the pictures and so on;
3. *Monitoring* concerns production checking while it takes place. However, since the strategies are taking place during planning, in the present study, monitoring concerns checking and correcting language production during the process of planning performance;
4. *Evaluation* regards judging how well one has accomplished the task. In other words, judging how well one is planning oral performance;

5. *Selective attention* regards attending to or scanning key words, phrases, sentences, linguistic markers, sentences or types of information;
6. *Rehearsal* concerns practicing the language to be used. For the purposes of the present study, rehearsal regards practicing oral narrative either by reading what was planned or by practicing the narratives mentally.

According to O’ Malley and Chamot (1990), cognitive strategies are more limited to a specific task and involve more direct manipulation of material. Examples of cognitive strategies are writing, summarizing, outlining, grouping, lexical search and compensation, translating, imagery, contextualization, elaboration, and avoidance. Following O’ Malley and Chamot (1990), these cognitive strategies were defined:

1. *Writing/summarizing/ outlining* were grouped together for the purpose of simplification. This concerns all types of written production during planning: writing words, sentences, paragraphs, outlines, and summaries;
2. *Grouping* regards classifying words, terminology, number, and concepts according to their attributes;
3. *Imagery* regards using visual images (either mental or by drawing) to understand and/or remember information;
4. *Lexical compensation* regards substituting words unknown, whereas 5) *avoidance* concerns circumventing an intended word or idea of being expressed. An example of lexical compensation is when a learner does not know how to say ‘peas’ and decides to substitute the unknown word by a familiar one ‘beans’. An example of avoidance is when a learner wants to express that ‘a man is not brave’ and decides to change this idea by expressing the idea that the ‘man doesn’t like to argue and never answers to what his wife says’. Lexical compensation and avoidance seem to interact;

5. *Lexical search*³ was added to the analysis of the present study to refer to lexical searches which are solved by means of successful retrieval of the lexical item being searched.
6. *Elaboration* concerns improving one's performance by relating new information to prior knowledge, and by making meaningful personal associations with the new information.

Finally, socio-affective strategies are related to social-mediating activities and interacting with others (O' Malley & Chamot, 1990). Examples of socio-affective strategies are cooperation, question for clarification, appeal for help and lowering anxiety. Following O'Malley and Chamot (1990), in the present study the following socio-affective strategies were defined:

1. *Question for clarification* (or appeal for help) refers to instances when learners are not able to cope with the demands of a task by themselves and ask others for help. In the present study, it refers to instances when learners ask the help of the present researcher;
2. *Lowering anxiety* concerns using mental techniques that help one feel comfort or competent.

Based on the introduction and review of the literature, it is reasonable to argue that 1) during planning learners engage in metacognitive processes that help online L2 performance; 2) pre-task planning is a problem solving activity and individual differences in working memory capacity may play a role on how successfully one engages in planning.

2. Method

The study was motivated by two research questions:

1. What mental processes do learners engage in when they plan an oral task?

2. Will higher and lower working memory span individuals differ in terms of the mental processes they engage in when they plan?

2.1 Data Collection

Data collection of the present study was divided into three phases. The first phase was the selection of participants which aimed at controlling for proficiency level. Participants performed the proficiency trial task at the language laboratory (see Guar-Tavares, 2011, for a detailed description of the selection of participants). The narrative task of the selection of participants was carried out under no planning conditions. Individuals had to look at a set of pictures for 50 seconds, and then the set of pictures was removed, and they had to start telling a story about the pictures.

The second phase consisted of the Speaking Span Test to measure participants' working memory capacity. Participants carried out the Speaking Span Test individually with the researcher in a computer lab. A training session took place before the test performance itself.

The third phase of data collection consisted of the second narrative task.⁴ Participants carried out the second narrative task under a planning condition; that is to say, they had 10 minutes to plan the oral task prior to performance. During planning, verbal protocols were carried out. When planning time was over, participants carried out the task; then, a retrospective interview was also conducted. As previously explained, the aim of the present study is learners' processes during planning.

2.2 Context and participants

Participants of the present study were twenty-five intermediate learners from the Letras⁵ Licenciatura, Letras Secretariado⁶, and also from the Extracurricular Language Courses at the Federal University of Santa Catarina (UFSC). Participants from the Extracurricular Language courses were undergraduate students at the Federal University of Santa Catarina from a variety of backgrounds (Biology, Engineering, Law, among

others). 15 were female and 10 were males. Their ages ranged between 18 and 29 years old.

2.3 The Speaking Span Test

A version of Daneman and Green's (1986) Speaking Span Test was used to measure individuals' working memory capacity. A training phase (20 words) preceded the testing phase (60 words). The test contained 60 unrelated words organized in three sets each of two, three, four, five and six words.

Each word was presented individually, on the middle line of a computer screen for one second. Participants were instructed to read each word aloud. At the end of each set, question marks appeared. These marks signaled the number of words that had to be stored and the number of sentences to be produced. Participants were instructed to use the words in the exact form and order they appeared to generate syntactically and semantically acceptable sentences, aloud, in English.

There were no restrictions concerning the length or complexity of the sentences produced. For instance, after being presented a set of three words: *guy - point - train*, a participant produced the following sentences: "I am a *guy*", "what's your *point*?"; "The *train* was dirty". Participants' speaking span score was defined as the maximum number of words for which they could generate grammatically and semantically acceptable sentences in English.

Following Daneman (1991), in this study, participants' responses, which were recorded, transcribed and analyzed, generated two different speaking span scores: a speaking span *strict score*, when all the sentences the subject produced contained the target word in the exact form and order of presentation; and a speaking span *lenient score*, when credit was given for sentences that contained the target word in a form other than that of presentation (e.g., target word being 'guy' and the word in the sentence produced being 'guys'), and half credit was given to words recalled in a different order. No credit was given to ungrammatical sentences in terms of syntax and semantics. Due to space constraints, only the results based on the *strict scores* will be dealt with in this paper.

2.4 The Speech Generation Task

The oral task used was a 'there-and-then' picture cued narrative (Robinson, 1995). Narrative tasks have been widely used in previous studies on task-based planning (Ellis, 1987; Kawauchi, 2005; Ortega, 1999), thus, allowing for comparison between the present study and previous ones in the field. Participants were instructed to look at the set of pictures for 50 seconds. Then, the picture was removed and they had 10 minutes to plan their oral performance. These procedures followed Mehnert (1998).

2.5 The verbal reports: retrospective on-line protocols and retrospective interviews

Following retrospective on-line procedures (Leow & Morgan-Short, 2004), participants were given 10 minutes to plan and were required to verbalize what they were planning in breaks of every *one* minute. After every one minute of planning they were prompted with the question: 'What were you just thinking about?' However, in moments in which participants stopped taking notes and seemed to be thinking hard or when participants erased part of their notes, I asked different questions: 'What were you just thinking when you stopped writing?' or 'What did you just erase from your notes?'

The ten-minute planning time was counted with the aid of a chronometer which was stopped during the verbalization so that participants could have ten minutes of actual planning. Also, the instances of verbalization were made the shortest possible so that they would not take participants away from the planning task itself. Basically, I asked the question and accepted whatever answer they gave me and instructed them to go on planning. In general, each verbalization was no longer than 30 seconds (including my question and the answer). The excerpt below illustrates a segment of the retrospective on-line protocol of participant 9:

Excerpt 1:

R: What were you just thinking about?

P: about how could I use the grammar the right way... thinking about the tenses of the verbs... about the right words to say what I want to say

R: What were you just thinking about?

P: I don't know how to say 'garrafa' and the past of think is thought?

Participants took a training session on these procedures and only started the verbal protocol itself when they had no doubts. After the retrospective on-line protocols, participants performed the narrative task. After performance of the task,⁷ an interview was also carried out for the purpose of complementing the retrospective on-line protocols. The interview contained questions concerning perceptions of the task under planning conditions and learners' processes during planning. This combination of protocols is suggested by Leow and Morgan-Short (2004).

3. Data Analysis

The analysis of the protocols consisted of three phases. I counted on the assistance of two interraters to help in the qualitative analysis. Both interraters were experienced researchers in the field of learning strategies. For the first phase I had assistance from the first interrater. First, we carried out an individual analysis in order to classify learners' protocols in strategies using the framework by O' Malley and Chamot (1990). Second, we got together in order to compare our findings concerning our strategy classification. Whenever there was disagreement between our classifications, we discussed the samples in order to reach consensus. At the end of the discussion, there were still a few instances of the protocols in which we could not reach consensus. Then, we contacted the second interrater in order to reach final consensus.

After the qualitative analysis, protocol data were submitted to statistical treatment. First, I counted the types of strategies employed by each participant. The counting was based on the different types of strategies reported by learners. When learners mentioned the same strategy for the same problem twice or more, only one instance of the strategy was counted.⁸ Second,

descriptive statistics analysis of the strategies reported by the participants was carried out to have an overall view of the strategies employed by higher and lower working memory spans.

Following Conway et al. (2005), the present study adopted an extreme group design in order to scrutinize differences between the strategies employed by lower and higher spans individuals more precisely. According to Conway et al., "extreme-group designs refer to contexts in which a continuous variable is categorized, and only the lower and upper ends of this variable distribution are represented" (p. 782). Extreme-group designs are common in the working memory literature, and they may be useful in the attempt to scrutinize differences between lower and higher spans individuals (Conway et al., 2005). The most common type of extreme-group design is based on quartiles; however, tertiles can also be used when data samples are small (Conway et al., 2005).

In order to conduct the extreme group design, the cutoff point was established between two percentiles: 33,3% and 66,6%. Based on these percentiles, participants were categorized as having higher working memory span when they fell in the upper tertile (the ones above 66,6%), and lower working memory span when they fell in the lower tertile (below 33,3%). Of the twenty-five participants, eight were classified as lower spans, and eight were classified as higher spans. The remaining nine participants were classified as intermediate spans and were not included in the analysis which focused specifically on comparing the strategies employed by *lower* and *higher* spans.

Finally, an independent t-test⁹ was performed to verify whether there were any statistically significant differences in the strategies employed by lower and higher spans during planning. For the statistical analyses, a probability level of $p < .05$ was used to determine statistical significance.

4. Results and Discussion

In the attempt to scrutinize the processes learners engage during planning, in this section, I will report the results of the analysis of the protocols conducted. First,

I will present the strategies reported by learners and provide illustrations of these strategies with examples from the protocols. Second, I will present the raw and percentage of learners reporting each strategy. Third, I will report the results of the descriptive statistics in order to give an overall view of strategy types reported by speakers. Finally, I will present the results of the t-tests computed in order to compare strategies used by lower and higher spans.

Table 1 provides examples of each strategy present in learners' protocols, and Table 2 displays the raw number and percentage of learners reporting the strategy types documented in the on-line protocols during pre-task planning and in the interviews after task performance. Although the analysis of individual differences was based on the differences between higher and lower spans, Table 2 also shows intermediate spans in order to give an overall picture of the whole group. From Table 3 on, only higher and lower spans will be shown in the analysis.

Table 1 Strategies reported by learners

STRATEGY	Examples
METACOGNITIVE STRATEGIES	
Organizational planning	"I was thinking of names to the characters and putting the story together" (p16)
Problem identification	"I was thinking what I do if I don't remember a word" (p02)
Monitoring	"I wrote here -didn't should- and should is a modal and I don't need to use the -didn't" (p07)
Evaluation	"I'm trying to check if the main ideas were organized in my story" (p18)
COGNITIVE STRATEGIES	
Writing/outlining/summarizing	"I wrote something like a skeleton" (p17)
Elaboration	"I am improving my sentences., for example, I said -they started to talk- and now I said -it seems that they stated to talk about..." (p01)

Imagery	"I was just remembering all the gifts that he bought to her and drawing the gifts" (p16)
Lexical search	"I was thinking how to say -engravidou- in English I want to use this word in my story" (p03)
Avoidance	"I tried to remember the verb -ter coragem- but I will use a different idea" (p04)
Lexical compensation	"I am changing the word -oprimido- for another like the man is shy and quiet and tiny" (p18)
Translating	"I thought of a verb, no an expression -finally- I thought in Portuguese then in English" (p06)
Cross language analysis	"I don't know how to say he's trying to let him crazy but I don't know if that's the word let, in Portuguese we say -deixar louco- (p12)
Rehearsal	"if I read it again I will imagine the story in my head to remember when I tell" (p.25)
SOCIAL/AFFECTIVE STRATEGIES	
Appeal for help	"Please, what do I do if I don't remember a word?"(p03)
Lowering anxiety	"I was thinking that if I start to worry too much about grammar I will be too nervous, I can't, I try not worry too much" (p25)

Table 2. Raw number and percentage of learners reporting the strategy types

Strategy types	Total sample (N = 25)		Lower spans (N = 8)		Intermediate spans (N = 9)		Higher spans (N = 8)	
	Raw	Percent	Raw	Percent	Raw	Percent	Raw	Percent
METACOGNITIVE STRATEGIES								
Organizational planning	16	64%	4	50%	6	66.6%	6	75%
Problem identification	7	28%	2	25%	2	22.2%	3	37.5%
monitoring	15	60%	4	50%	4	44.4%	7	87.5%
evaluation	7	28%	3	37.5%	2	22.2%	3	37.5%
Rehearsal	11	44%	2	25%	5	55%	4	50%
COGNITIVE STRATEGIES								
Writing/outlining/summarizing	21	84%	6	75%	7	77.7%	8	100%
Elaboration	10	40%	2	25%		44.4%	4	50%
Imagery	5	20%	1	12.5%		22.2%	2	25%
Lexical search	24	96%	7	87.5%		100%	8	100%
Avoidance	3	12%	1	12.5%		11.1%	1	12.5%
Lexical compensation	7	28%	1	12.5%		33.3%	3	37.5%
translating	2	8%	1	12.5%		11.1%	0	0%
Cross language analysis	2	8%	1	12.5%		0%	1	12.5%
SOCIAL/AFFECTIVE STRATEGIES								
Appeal for help	1	4%	1	12.5%		0%	0	0%
Lowering anxiety	1	4%	0	0%		0%	1	12.5%

As can be seen in Tables 1 and 2, in general, the strategies most reported were lexical search (96%), writing/summarizing, outlining (84%), organizational planning (64%), monitoring (60%), rehearsal (44%) and elaboration (40%). In addition, it can be seen that more learners in the high span memory group reported using these most frequent strategies than did learners in the lower span memory group. Out of the learners who reported using organizational planning, six were higher spans and four were lower spans. This pattern was even more evident in monitoring with seven higher spans and only four lower spans reporting this strategy.

As for writing/summarizing/outlining, it can be seen that this strategy was frequently reported in all span groups, but again, the number of higher spans,

eight, was greater than the number of lower spans, six. The differences were identical for elaboration and rehearsal, with four higher spans and two lower spans reporting the use of these strategies.

Overall, the most frequent strategies (lexical search, organizational planning, writing/summarizing/outlining, monitoring, rehearsal and elaborating) were reported more frequently by higher spans than by lower spans. In order to examine whether there are statistically significant differences between higher and lower spans as regards the strategies reported, an independent t-test was performed.

Since the use of social/affective strategies was extremely low with only one lower span learner reporting appeal for help and only one higher span

learner reporting a lowering anxiety strategy, these strategies were not included in the independent t-test. The focus was on examining differences between the number of metacognitive and cognitive strategies as well as differences in the total number of strategies (cognitive and metacognitive all together) employed by learners.

Table 3 displays the descriptive statistics of strategies reported by lower and higher spans and Table 4 displays the results of the independent t-test.

Table 3. Descriptive statistics – strategy types reported by learners

	All strategies	Metacognitive	Cognitive
Lower spans (N=8)			
Mean	3.5	1.6	1.75
SD	1.06	.51	.88
Minimum	2	1	1
Maximum	5	2	3
Higher spans (N=8)			
Mean	5.25	2.75	2.37
SD	1.48	.88	1.18
Minimum	2	1	1
Maximum	8	4	4

Table 4. Independent t-test - strategy types reported by lower and higher spans p<0. 05

	Group	N	t	df	Sig. (2-tailed)
All strategies	higher spans	8	2.701	12.70	.018
	lower spans	8		6	
metacognitive strategies	higher spans	8	3.100	11.27	.010
	lower spans	8		6	
cognitive strategies	higher spans	8	1.193	12.95	.254
	lower spans	8		1	

p<0.05

As can be seen in Table 3, the means of strategies reported (all strategies, metacognitive and cognitive) favor higher spans when compared to lower spans. As shown in Table 4, some of these differences achieved statistical significance. There were statistically significant

differences in the number of *all strategies* reported by lower and higher span learners ($t = 2.701, p = .018$); and there were also statistically significant differences in the number of metacognitive strategies reported ($t = 3.1, p = .010$). Being the fact that differences in the number of cognitive strategies reported was not significant ($t = 1.193, p = .254$), it seems that it was the difference in the number of *metacognitive strategies* which accounted for the differences in the total number of strategies.

In brief, results concerning the processes learners engage in show that:

1. Learners engaged mainly in lexical search, organizational planning, monitoring, rehearsal and elaboration during pre-task planning;
2. Higher span individuals employed significantly more metacognitive strategies than lower spans during pre-task planning.

As shown in Table 2, the strategies most frequently reported by learners were lexical search (96%), writing/summarizing/ outlining (84%), organizational planning (64%), monitoring (60%), rehearsal (44%) and elaboration (40%). These results corroborate those reported by Ortega (2005) concerning organizational planning, writing/summarizing/outlining, lexical searches, rehearsal and monitoring. However, in Ortega's study, translation and empathizing with the listener were also frequently reported by learners.

As regards empathizing with the listener, participants of the present study did not have a listener present while they performed their planned narratives. I was present during planning time to carry out the retrospective on-line documentation of what they were planning. Nevertheless, I left the room after planning was over so that they would be comfortable to tell their narratives. This may explain why there were no instances in which learners verbalized any concern with the listener.

Concerning translation, it was frequently reported in Ortega's study but only two learners of the present study reported this strategy. It is important to highlight that in Ortega's (2005) study, learners were given

pictures and also listened to a recorded version of the stories in their L1 before retelling. This may have biased learners to rely more on translation during retelling (Ortega, 2005). Learners of the present study were asked to tell stories based on pictures only.

Apart from translation and empathizing with the learners, strategies most frequently used in the present study corroborate Ortega's findings and point at the emphasis on retrieval and rehearsal operations during pre-task planning.

The protocols revealed that learners try to have a general organization of ideas before they actually think of the specific formal aspects of the language they are going to use. At the beginning of planning, they often referred to the pictures, focused on what happened in the stories as if they were trying to decide on the content of their narratives. Such mental operations seem to rely upon the conceptualizer in which the message content is planned (Levelt, 1989). The following excerpts illustrate these instances.

Excerpts

"I was thinking to organize my stories according to the pictures" (p10)

"I'm thinking of each picture and a general comment about them" (p25)

"I was just thinking that the story is about a couple and about what the husband is thinking" (p01)

As these excerpts show, learners seem to focus on the general organization of their stories, and try to set their communicative goals before they actually concentrate on more specific aspects of language. First, learners seem to have an overall organization of ideas by focusing on the content of their stories.

As learners move on to more specific aspects of language, the strategy most frequently reported was lexical search. All learners reported a concern with finding proper lexical items to use in their stories. This ubiquitous focus on words is in line with the claim that speech production is lexically driven; that is, knowing words is the paramount condition for expressing ideas orally (Levelt, 1989).

Such lexical searches in which learners engaged draw upon formulation at the level of grammatical encoding, more specifically in *lexical selection*, which involves the identification of lexical concepts that are suitable for conveying the speaker's meaning (Levelt, 1989).

When searching for words, learners would either remember the words and include them in the planning of their narrative tasks, or notice a gap in their interlanguage (Swain, 1985) and, consequently, avoid unknown words by changing the intended messages or keeping the messages but substituting words. The following excerpts illustrate these instances:

Excerpts

"How to say pedaço de Madeira in English...
palavras como bater jogar agora eu já lembrei"(p02)

"I'm thinking that I don't remember how to say *ervilha* in English and I will change it to another word...beans" (p07)

"I tried to remember *ter coragem* but I will use he did not get to reply or to give a response to her" (p04)

As the first excerpt shows, the learner was able to retrieve the lexical items being searched, whereas in the subsequent excerpts learners were not able to find the lexical items being searched. Participant 07 substituted the word *ervilha* for beans, participant 04 substituted a whole sentence.

After setting the general content of the stories and focusing on some formal aspects of the language in order to convey their communicative ideas, learners often reported being concerned with rehearsing their stories and monitoring overall content and form.

Excerpts

"I'm reading, if I read it again I will imagine the story in my head so I can remember when I tell" (p24)

"I checked the plural of the words and corrected a mistake" (p23)

" I was reading and I decided something different for the end" (p17)

As these excerpts show, learners also attempt to rehearse their stories during planning time. Moreover, they monitor for improving overall content as participant 17 verbalizes: “*I was reading and I decided something different for the end*”; and also monitor for improving grammar “*I checked the plural of the words and corrected a mistake*”.

It seems reasonable to conclude that, in general, planning assists performance by allowing learners to engage in organizational, retrieval, rehearsal and monitoring operations. More specifically, the strong emphasis on lexical searches, organization of ideas, and monitoring imply that learners seem to anticipate problems on the stages of conceptualization, formulation and monitoring (Levelt, 1989).

At this point, I would like to address the discussion of focus on *meaning* and *form* during planning wisely put forward by Ortega (2005). In planning, Ortega (2005) argues, “learners engage in solving form-in-meaning problems” (p.106). In this sense, she advocates the need to challenge the dichotomization of form and meaning. Ortega (2005) distinguishes two positions towards the dichotomization of form and meaning. According to her, Skehan and Foster (2001) and VanPatten (2002) emphasize the dichotomization between form and meaning by drawing on *limited* capacity theories of attention. On the other hand, she states that Dekeyser et al (2002), drawing on *unlimited* capacity theories of attention, claim that the dissociation between meaning and form is impossible, and attention to both is clearly possible.

Throughout the protocols of the present study, a focus on form from the part of learners was clearly stated. However, these instances of focus on form did not take place in a vacuum; they emerged as learners attempted to convey meaning. The following excerpts illustrate these instances of focus on form in the attempt to convey meaning.

Excerpts

“I’m still thinking in the things that the man thought, I was trying to remember the pictures...I was thinking in the correct word to use...I think in using *make* but I think *do* is better” (p07).

“I’m thinking about the relationship between Caio the guy and Ana the girl ...I’m thinking of using the word *jealous* in the story and that I’ve been Caio once” (p16).

From these excerpts, it can be seen that in the attempt to convey the general meaning of their stories, learners focused on form. As in the first excerpt which shows that the learner is working on content “*I’m still thinking in the things that the man thought, I was trying to remember the pictures*”. The pictures of the narrative being planned by this learner display a series of thoughts of a man in relation to things he would like to do to his wife. In the attempt to express the man’s thoughts, the learner focuses on what verb is suitable “*I think in using ‘make’ but I think ‘do’ is better...*”

In the second excerpt, the learner also seems to focus on content “*I’m thinking of the relationship of the guy Caio and Ana the girl*”. Then, he focuses on a specific lexical item which seems necessary to express ideas about the relationship of the couple “*I’m thinking of the word ‘jealous’ in the story*”.

Taking these instances of focus on form in the attempt to convey meaning, I believe it is reasonable to argue that learners actually *shift* attention from meaning to form and vice-versa. If one takes Engle’s (1999) perspective on working memory, individuals differ in knowledge and ability to manipulate knowledge as well as in the capacity for sustaining, maintaining, and *shifting* attention. Therefore, attention to meaning *and* form may be possible not because attentional resources are unlimited, but because learners *shift* attention from meaning to form and vice-versa throughout planning time.

During pre-task planning, learners activate information from long-term memory necessary to convey meaning, which may be information containing knowledge about the world, about the L2 (semantic memory), and also information acquired through personal events (episodic memory). Learners need to activate information necessary to convey meaning, and maintain this information activated and easily accessible, while processing formal aspects of the language (e.g. lexical and grammatical problems), which will be subsequently integrated into the information necessary to convey meaning.

I believe simultaneous attention to meaning *and* form during pre-task planning is clearly possible. The *extent* to which form and meaning are activated; that is to say, the ability to *control* and *shift* attention from meaning to form and vice-versa is what seems to differ according to individual differences in working memory capacity. In this way, by activating meaning information from long-term memory, maintaining it activated and accessible while processing formal aspects of the language, learners seem to address their 'form-in-meaning problems' during planning (using Ortega's terminology).

Having discussed learners' processes during planning and addressed the discussion on focus on meaning and form during planning, now I turn to the results on the differences in the processes lower and higher spans engage in when planning.

Ortega (2005) found evidence that individual differences in terms of language expertise reflect in the processes learners engage during pre-task planning. Her results suggest that advanced learners engage more fully with self-monitoring and are able to allocate efforts towards retrieval and rehearsal operations in a more balanced fashion than low-intermediate learners.

Results of the present study suggest that in a more homogeneous group in terms of language expertise,¹⁰ individual differences in working memory capacity may reflect differences in the ways learners approach planning. Results showed that higher spans used significantly more metacognitive strategies when compared to lower spans. They also tended to use planning time to elaborate and write/outline/summarize more frequently than lower spans.

The greater use of metacognitive strategies by higher spans encompasses differences in the use of strategies such as organizational planning, problem identification, monitoring, and rehearsal by higher spans since these were the metacognitive strategies reported throughout the protocols. As can be seen in Table 2, the greater differences between lower and higher spans were in terms of rehearsal, organizational planning and monitoring. Rehearsal was reported by 25% of the lower spans and by 50% of the higher spans; organizational planning was reported by 50% of the

lower span and by 75% of the higher spans respectively; and monitoring was reported by 50% of the lower spans and by 87.5% of the higher spans respectively.

It seems fair to say that the general tendency was that higher spans were more able to carry out some sort of organization before engaging in the task itself by organizing pictures in a sequence, deciding on general content and setting communicative goals. Then, they searched for lexical items, engaged in solving lexical grammatical problems, and, finally, still used some of their planning time to monitor, elaborate and embellish their stories as well as to rehearse their plan for the upcoming performance.

Lower spans, on the other hand, did not seem to engage in organizational planning, monitoring, and rehearsal as much as higher spans did. Most of them seemed to embark straight in searching for lexical items and solving grammatical problems without a general organization a priori. Moreover, they did not engage in monitoring, rehearsing and elaboration as much as higher spans after lexical items were searched, grammatical problems were solved and a general sketch of the story was accomplished.

Results suggest that learners tend to use planning time to anticipate problems in conceptualization of the message, formulation, and monitoring. Taking individual differences in working memory into account, higher spans seem to focus on conceptualizing and monitoring more frequently than lower spans.

Higher spans significantly outperformed lower spans in the number of metacognitive strategies used. Within these metacognitive strategies, the differences between higher and lower spans seem to rely mainly on rehearsal, organizational planning, and monitoring. Levelt (1989) claims that *conceptualizing a message* and *monitoring* are the two components of L1 speech production that draw more heavily on learners' attentional resources.

In conceptualizing and message construction, speakers do not have a fixed slot of intentions to convey, and communicative intentions can vary in countless ways. As for monitoring, it demands attentional control in the sense that the speaker attends to his own internal and overt speech (Levelt, 1989). To reiterate, Levelt's

(1989) model accounts for L1 speech production, and in the case of L2 speech, conceptualization and monitoring may be even more severely under attentional control (Fortkamp, 2003).

In brief, results suggest that learners tend to use planning time to anticipate problems in conceptualization of the message, formulation, and monitoring. Taking individual differences in working memory into account, higher spans seem to focus on conceptualizing and monitoring more frequently than lower spans.

The finding that higher and lower spans differed in terms of the processes they engage during planning is an interesting finding in itself which merits reasonable speculation. The last question to be pursued in this discussion of results is: why do higher spans tend to employ strategies more effectively during pre-task planning when compared to lower spans?

I believe that the greater ability to control attention among the various requirements of planning as a problem solving activity (Hambrick & Engle, 2003) seems to allow higher spans to sustain, maintain and shift attention among the different strategies employed during planning—organizing ideas, searching lexical items, monitoring, rehearsing, and elaborating—in a more balanced fashion when compared to lower spans. In other words, higher spans have more ability to control and allocate attention towards different strategies during planning.

Final Remarks

The goal of this study was to investigate learners' processes during pre-task planning and individual differences in working memory capacity within the learners' processes during pre-task planning. Overall results revealed that 1) learners engage mainly in organizational, retrieval, rehearsal, monitoring, and elaboration during planning, and 2) higher spans employ significantly more metacognitive strategies when compared to lower spans.

In order to account for the finding that higher spans tend to use strategies in a more balanced fashion, making use of more metacognitive strategies, it has

been suggested that higher spans are more able to cope with the requirements of planning as a problem solving activity, which demands controlled attention (Hambrick & Engle, 2003). Based on the attention-view of working memory (Engle et al., 1999; Hambrick & Engle, 2003), higher spans tend to be more able to activate and manipulate knowledge, as well as to sustain, maintain and shift attention (e.g. from meaning to form and vice-versa) during pre-task planning.

The present study has a few limitations. The sample size was small, only twenty-five participants, and the extreme group design compared only eight higher working memory participants with eight lower working memory participants; there was only one test to measure working memory capacity, the Speaking Span Test; only one proficiency level was investigated, the intermediate level. Despite its limitations, the study is relevant since it took a *process* oriented approach towards planning, scrutinizing learners' processes. Furthermore, the study addressed individual differences within planning, going beyond the general idea that all learners will benefit from planning to the same extent. Some learners may need guidance on how to plan. Finally, the study demonstrated the role of working memory capacity *within planning* as a problem solving activity, representing a step forward to studies that have speculatively explained results in terms of attentional tradeoffs.

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Notes

1. The research was funded by CNPq
2. The terms 'strategic planning' and 'pre-task planning' will be used interchangeably in the present study to refer to planning which takes place before a task is performed (Ellis, 2005). The term 'online-planning' will be used to refer to planning as a cognitive process inherent to the act of speaking (Levelt, 1989). The term 'task-based planning' will be used to refer to the field of research on task planning (Skehan, 1996, 1998).
3. O' Malley and Chamot (1990) do not include this strategy in their framework, and Ortega (2005) does not include a category called lexical search in her analysis. For them, lexical compensations and

avoidance are all instances of lexical searches. Although I agree that compensation and avoidance imply lexical searches, I believe it is also important to highlight the lexical searches that end up being solved by successful retrieval of the proper lexical item because learners of the present study frequently searched and retrieved the proper lexical items.

4. The first narrative task was the one carried out for the purpose of selecting participants and under a no planning condition. The focus of the present study is learners' processes on the planning of the second narrative task.
5. Undergraduate Language Teaching program.
6. Undergraduate Bilingual Secretary program.
7. It is important to highlight again that *performance* on the second narrative task is not the focus of the present study. The focus is to examine learners' processes during planning of the narrative task. (For a complete investigation of learners' performance on the narrative task after planning, see Guar-Tavares, 2011, 2013).
8. Sometimes learners mentioned the very same strategy for the same problem twice or more, for example: "I'm trying to remember the word for *ervilha*", "I'm trying to remember the word for *ervilha*", "Oh, I'm still trying to remember the word *ervilha*". In these cases, only one instance of lexical search was counted.
9. Data were normally distributed. See Guar-Tavares (2008) for a complete analysis of Kurtosis and Skewness scores.
10. As mentioned in the method, participants of the present study were intermediate learners.

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