

## The role of L2 proficiency in simultaneous attention to form and meaning in L2 German

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**Abstract.** Within VanPatten’s (1990, 2004) framework of input processing, this study investigates how different types of form-meaning attentional conditions affect comprehension of written input. VanPatten’s (1990, 2004) views learners as limited capacity processors, attending to content before grammatical form, and argues that attention to form takes away some processing capacity, resulting in lower content intake. Recent research contradicts these findings (e.g., Leow, Hsieh, & Moreno 2008). However, most evidence on form-meaning connections comes from L2 Spanish (e.g., VanPatten 1990, Leow et al. 2008), which calls for evaluating the generalizability of PMP cross-linguistically. Addressing this drawback, this research assesses how intake is affected by 1) simultaneous attention to form and meaning in L2 German and 2) L2 proficiency for different attentional conditions. Results indicate that processing for form in L2 German has no significant effect on simultaneous processing for meaning and on subsequent intake, regardless of the proficiency level.

**Keywords.** input processing; L2 proficiency; L2 German; form-meaning connections

**1. Introduction.** One of the assumptions in the fields of second language acquisition (SLA) and cognitive science is that L2 learners must pay attention to input in order for it to be processed beyond short-term memory (e.g., Schmidt 1990, 2001). Attention is thus viewed as selective, limited and necessary for transferring information into long-term memory storage (e.g., McLaughlin 1987, Schmidt 2001, Tomlin & Villa 1994). The current study is also premised on the psycholinguistic notion of learners as limited capacity processors (cf. McLaughlin 1987). This presupposes that adult L2 learners have limited attentional resources while processing input, which results in inevitable competition between attention to certain aspects of the input.

## 2. Literature review

2.1. THEORETICAL FRAMEWORK. The notion of an adult L2 learner as a limited capacity processor has been taken as the basis for VanPatten’s (1994, 1996, 2004) framework of input processing. Within this framework, he proposes a model that considers input processing as the primary stage of L2 acquisition. VanPatten defines a number of principles that predict how learners allocate attention to linguistic input. The two contrasted aspects of input are attention to form and attention to meaning. Attention to form involves attending to some grammatical form, including a syntactic or a morphosyntactic form, whereas attention to meaning can be defined as focusing on the meaning, or on the content, expressed by a target structure.

According to VanPatten’s Primacy of Meaning Principle, or Principle 1 (1994, 1996, 2004), attention to meaning happens before attention to form in input processing. The proposal of this principle has led to some research on simultaneous attention to form and meaning in both

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written and aural input (Leow, Hsieh & Moreno 2008, Morgan-Short, Heil, Botero-Moriarty & Ebert 2012, VanPatten 1990, Wong 2001) (discussed in detail in the next section). The results of this previous research partially support Principle 1 although some of these studies (e.g., VanPatten 1990, Wong 2001) failed to methodologically establish whether participants did pay attention to meaning in all experimental conditions, their only variable being attention to different types of form. In order to resolve this methodological drawback, later research on simultaneous attention to form and meaning introduced an introspective concurrent data elicitation procedure, or think-aloud protocols (Leow et al. 2008, Morgan-Short et al. 2012), which allowed to control for the type of attentional condition in order to evaluate its effects on subsequent comprehension of L2 data. Think-aloud protocols thus allowed to test for the depth of processing (DOP), which is the amount of cognitive effort put into processing the target structure (Leow 2015). The following section covers the design and results of the previous studies that addressed the strand of simultaneous attention to form and meaning and VanPatten's Principle 1.

2.2. EMPIRICAL DATA ON FORM-MEANING CONNECTIONS. The first study to address the issue of simultaneous attention to form and meaning was conducted by VanPatten (1990). The participants in the study were first-semester, fourth-semester, and third-year L1 English-L2 Spanish college-level students (N=202) in intact classes. The four experimental conditions included: 1) listening for content (control group), 2) listening for content and the lexical item *inflación* ('inflation'), 3) listening for content and the definite article *la* ('the<sub>SING.FEM</sub>'), and 4) listening for content and the verb morpheme *-n*<sub>3PERS.PL.PRESENT.INDIC</sub>. The participants had to listen to a text (275 words) on inflation in Latin America. The text included 11 instances of the target lexical item, 12 instances of *-n*, and 13 instances of the article *la*. Participants had to put a check mark on a blank piece of paper every time they heard their designated target structure. A post-exposure task (in the form of free recall in English) administered immediately after the listening measured comprehension through scoring the number of idea units. The results suggested that simultaneous attention to content and a grammatical morpheme (*la*, *-n*) resulted in lower recall scores. However, there was no significant difference between listening for content only and for both content and the lexical item. Similarly, there was no statistically significant difference between the results from listening to content and either of the two morphemes. These findings suggested that conscious attention to form in input takes away some processing capacity from attention to meaning. As for the effects of proficiency level on recall scores, the results were mixed. The more proficient learners were generally better at recall scores than less proficient learners, however at the verb inflection task their performance was similar to that of more proficient students, suggesting that at higher levels bound and free morphemes are attended to differently.

Wong (2001) did a partial replication of VanPatten's (1990) research design, with the exception of the *-n* condition. L1 French – L2 English (N=79) college-level low-intermediate students from intact classes were exposed to the same text translated into English in written or aural mode. The post-exposure task was also the same as in VanPatten (1990). In the aural mode, the results revealed that comprehension was significantly better when listening for content only as compared to also listening for the definite article, whereas there was no significant difference between listening for content only and for content and the lexical item. In the written mode, there was no significant difference in comprehension between the lexical item group and the definite

article group, which suggested that input mode also matters in simultaneous attention to form and meaning.

2.3. INTRODUCING DEPTH OF PROCESSING TO OPERATIONALIZE ATTENTION. Leow, Hsieh, and Moreno (2008) did a conceptual replication of VanPatten (1990), addressing some methodological issues of the previous research. First, due to its saliency, they changed the lexical target *inflación* into a monosyllabic word (*sol* ‘sun’). Second, they controlled for both an equivalent number and an even distribution of targeted forms in the input. Next, they changed the post-test assessment task into cognitively less taxing multiple-choice comprehension questions, which were administered immediately after the reading. Finally, using concurrent think-aloud protocols, they operationalized how attentional resources are allocated during input processing. Seventy-two L1 English – L2 Spanish college-level participants in their 2nd semester were randomly assigned to read a modified version of a text on Aztecs. The experimental conditions included: 1) reading for content (control group), 2) reading for content and circling the lexical item *sol* (‘sun’), 3) reading for content and the definite article *la* (‘the<sub>SING.FEM</sub>’), 4) reading for content and circling all the instances of the clitic *lo* (‘its<sub>SING.3PERS.ACC</sub>’), and 5) reading for content and the verb morpheme *-n*. While reading to the passage, all the participants were required to think aloud, which allowed to check whether they were indeed processing for meaning. The results proved that deeper processing did not negatively affect processing for meaning, as there was no significant difference in comprehension among all five groups.

Partially replicating Leow et al.’s (2008) research design, Morgan-Short, Heil, Botero-Moriarty, and Ebert (2012) tested 308 L1 English – L2 Spanish college-level third-semester participants, who either did or did not think aloud during exposure to written input. The results indicated that there were no significant differences in comprehension between the experimental groups and that thinking aloud did not create reactivity effects.

The effects of DOP on intake were also addressed in the experiment by Calderón (2013), in which 24 L1 English – L2 Spanish college-level participants (1<sup>st</sup> vs. 3<sup>rd</sup> semester) were exposed to an aural text with the target grammar form immediately followed by a multiple-choice sentence completion (measuring intake) during off-line concurrent verbal reports (measuring depth of processing and levels of awareness). The results suggested that high depth of processing is facilitative at the intake stage on both high and low proficiency levels. Unlike previous research on form-meaning connections and DOP, this study explicitly compares proficiency levels. However, some questions still remain: Is higher depth of processing similarly facilitative for comprehension for meaning on different proficiency levels in written input? Will more proficient students demonstrate better performance on recall tasks if they employ the same level of DOP as less proficient students?

**3. Motivation for the current study.** As illustrated in the section on empirical data, previous research on simultaneous attention to form and meaning has the following shortcomings. First, there have been inconsistent results on whether simultaneous attention to form and meaning does affect comprehension. Second, no clear conclusion can be made with respect to the interaction of L2 proficiency and its effects on subsequent comprehension under different types of form-meaning attentional conditions. More specifically, only two studies have focused on two proficiency levels (Calderón 2013, VanPatten 1990). However, VanPatten (1990) failed to control for whether participants paid attention to meaning under all experimental conditions (e.g., by failing to implement think-aloud protocols or any other introspective measure for that matter). Third, most research on form-meaning connections and DOP has been done in L2

Spanish (e.g., VanPatten 1990, Leow et al. 2008, Morgan-Short et al. 2012, Calderón 2013), which calls for evaluating the generalizability of the previous findings across other languages and target structures. Finally, the issue of generalizability of previous research is tightly connected to the underestimated role of replication studies in SLA. As pointed out by Porte (2013) and Plonsky (2015), replications in SLA provide interconnected research findings, which can lead to less stagnation in SLA. Therefore, more replication studies, whether they are exact, approximate or conceptual, are needed in order to establish both internal and external validity of previous research.

#### **4. Research question and variables**

4.1. RESEARCH QUESTION. The current partial replication of Leow et al. (2008) addresses the following research question: How do different types of form-meaning attentional conditions affect subsequent comprehension of written input for adult L2 German participants on elementary and intermediate proficiency levels?

4.2. VARIABLES. The dependent variable is L2 reading comprehension on the post-test (10 questions), which was coded through scoring one point or zero per question with a maximum of 10 points for the task. The independent variables are the proficiency level (either the second semester or the fourth semester) and the type of structure/attentional condition. The attentional conditions include: 1) reading for content and simultaneously noting the key lexical item (*Mädchen* ‘girl’, 2) reading for content and simultaneously noting the syntactic item – the masculine definite article *der* (‘the<sub>NOM</sub>’), 3) the control group – reading for content only (i.e., with no task to circle a target). Depth of processing (DOP) was operationalized through think-aloud protocols and contained three levels as in Leow et al. (2008). Level 1 requires circling the target, Level 2 involves a verbal report of having attended to target, and Level 3 includes either interpreting or translating the target.

#### **5. Methodology**

5.1. PARTICIPANTS. Participants were college-level L1 English – L2 German learners enrolled in either second- or fourth-semester German classes at an American university (N=35). They were randomly assigned to one of two experimental conditions or to a control group within each proficiency level. The participants eliminated from the original participant pool included those who 1) did not complete both sessions of the experiment, 2) were not native speakers of English, 3) indicated extensive L2 German immersion experience on the language background questionnaire, 4) did not think aloud if assigned to an experimental condition; 5) did not pay attention to a minimum of 60% of the targeted forms (following Leow et al. 2008).

5.2. PROCEDURE. All the experiment took between twenty and thirty minutes and was done on the same day for each participant. After reading and signing the consent for participation in research form, participants were randomly assigned to one of the three groups within each proficiency level and performed a warm-up think-aloud problem-solving practice exercise. After completing the practice task, participants read the experimental text while recording concurrent think-aloud protocols. The instructions they received for the experimental task followed those of Leow et al. (2008). Participants in the lexical and in the syntactic experimental groups within each proficiency level were also asked to circle their targeted form in the text as they were reading for comprehension. Immediately after reading the text, participants were required to do the post-test multiple-choice recognition task with think-aloud protocols in either English or

German. After finishing the post-test, the participants completed the language background questionnaire. The complete timeline of the experimental procedure is presented in Figure 1 below.

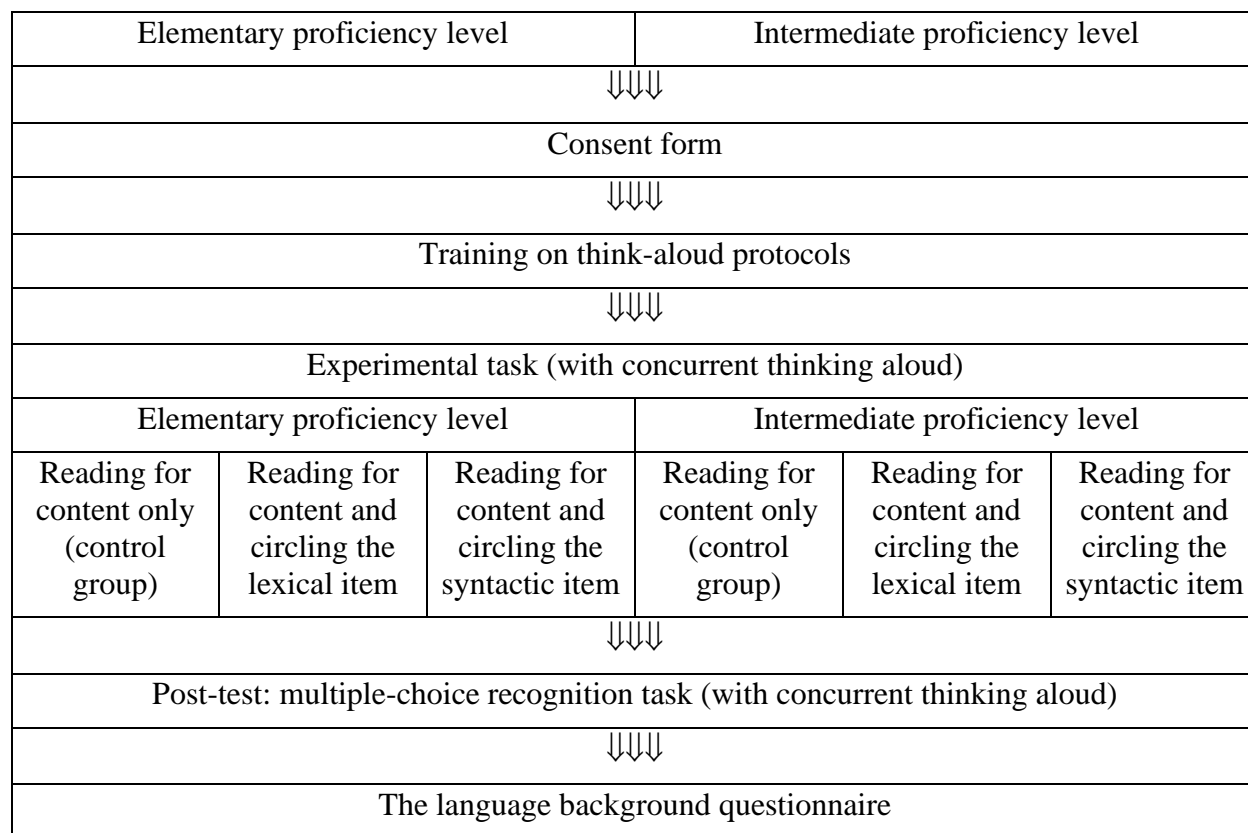


Figure 1. The timeline of the experiment

5.3. MATERIALS. The reading passage is a modified version of an authentic article on travelling, “Ein Tag in Frankfurt am Main” (“A Day in Frankfurt on the Main”). The topic was chosen based on the material covered in the first year of instruction in L2 German to make sure that the students understand the main vocabulary necessary for text comprehension. This was done in order to eliminate the potential possibility that poor vocabulary knowledge rather than simultaneous attention to both form and meaning would lead to lower performance on the post-reading comprehension test.

Modifications of the original text address the following issues (as in Leow et al. 2008): 1) shortening the length of the passage to approximately 350 words, 2) controlling for an equivalent number of targeted linguistic forms (10 instances of each), and 3) controlling for an even distribution of the targeted forms in the passage. The ten post-reading comprehension questions addressing the main concepts of the text were presented in English.

After the post-test, participants were required to complete a language background questionnaire based on the LEAP questionnaire (Marian, Blumenfeld & Kaushanskaya 2007). This questionnaire was done in order to check for the following: 1) that English is their L1; 2) how many years of L2 German each participant has had by the time of the experiment; 3) any other languages spoken in the family; and 4) any L2 German immersion experience.

**6. Results.** Attention in this experiment was coded following Leow et al. (2008), however all the participants in all the experimental conditions only circled the corresponding target, without providing a verbal report or interpreting or translating the target. Consequently, no deep processing was observed in all the data samples.

The null hypothesis was that there is no effect of attentional condition on comprehension on each proficiency level. The alternative two-tailed hypothesis was that reading for general comprehension or for both general comprehension and the lexical item will lead to a different performance on the post-test as compared to reading for both general comprehension and the syntactic item for both proficiency levels.

The descriptive statistics of the post-test results for each attentional condition on both proficiency levels are presented in Table 1 below.

	SD	Post-test mean score (out of 10 maximum)
elementary control	1.26	7
elementary lexical group	0.55	5.6
elementary syntactic group	0.98	7.16
intermediate control	0.55	7.5
intermediate lexical group	1.4	7
intermediate syntactic group	0.75	6.16

Table 1. Mean comprehension scores and standard deviations by condition

On the elementary level, in the lexical condition group, the mean of the circled target items was 10 out of 10, suggesting that all the participants in the lexical condition did pay attention to all the targets. However, in the syntactic condition group, the mean number of circled target items was 7.7 (SD = 1.37), indicating that participants in this condition did not pay attention to all the target items. On the intermediate level, in the lexical condition group, the the mean of the circled target items was 9.8 (SD = 0.41), and in the syntactic condition group, the mean number of circled target items was 7.8 (SD = 0.75).

On the elementary proficiency level, the one-way ANOVA showed no significant main affect for the attentional condition,  $F(2, 14) = 3.94, p > 0.05$ , a significant difference being only between the lexical and syntactic groups (a two-sample t-test assuming equal variance,  $t(9) = -3.16, p = .01$ ). On the intermediate proficiency level, the one-way ANOVA revealed no significant main affect for the type of attentional condition,  $F(2, 15) = 2.85, p > 0.05$ , a significant difference only being found between the control and syntactic groups (a two-sample t-test assuming equal variance,  $t(10) = 3.5, p = .006$ ).

Since the sample sizes in each experimental condition on each proficiency level were relatively small, it was not possible to run a factorial ANOVA to analyze the effects of attentional condition and proficiency level and their interactions on the dependent variable (post-test performance). However, two-sample t-tests comparing the post-test means on each experimental condition across proficiency levels suggest that, although intermediate participants generally had higher mean post-test scores than elementary level participants, this difference was not statistically significant. Thus, no statistically significant results were found for the following

pairs: i) the elementary and the intermediate lexical group,  $t(9) = -2.07, p > .05$ ; ii) the elementary and the intermediate control group,  $t(10) = -0.89, p > .05$ ; iii) the elementary and the intermediate syntactic group,  $t(10) = 1.98, p > .05$ .

**7. Discussion.** The research question of the current study aimed to analyze how simultaneous attention to both grammatical form and lexical meaning during reading in L2 affects subsequent comprehension of the text on elementary and intermediate proficiency levels. The initial prediction for both proficiency levels was that reading for general comprehension or for both general comprehension and the lexical item will result in a different performance on the post-test as compared to reading for both general comprehension and the syntactic item, due to the attentional load caused by focusing on a grammar item. However, results indicate that our initial prediction was not correct, and processing for form has no significant effect on simultaneous processing for meaning and on subsequent intake, regardless of the proficiency level. This provides more cross-linguistic support for Leow et al. (2008) and Morgan-Short et al. (2012) and contradicts VanPatten (1990).

Also, contrary to some previous findings (e.g., VanPatten 1990, Wong 2001), the performance in the syntactic group on the elementary proficiency level was significantly better than in the lexical group. Specifically, the participants from the lexical group performed the worst, followed by the control group, followed by the syntactic group. One possible explanation is small sample sizes of each group. Another explanation is that, since the mean amount of time spent reading the passage in each condition was not statistically significant, such unexpected performance on the syntactic condition was due to the amount of attention paid to the target item (the mean of circled lexical targets=10 out of 10, the mean of circled syntactic targets =7.7) rather than the nature of the target item itself.

As for the intermediate proficiency level group, the lowest scores on the post-test were observed in the syntactic condition. Taking into account that the participants from the syntactic group circled fewer target structures as compared to the participants from the lexical group, we could expect that participants in the syntactic condition could allocate more attention to the general comprehension and thus perform better on the post-test than the lexical group, which was not the case. This tendency might suggest that processing syntactic items does require more attentional resources than processing lexical items, which is in line with some previous findings (e.g., VanPatten 1990, Wong 2001).

**8. Conclusion and further related research.** This research has found no main effect of attentional condition on simultaneous comprehension of written input in L2 German on both elementary and intermediate proficiency levels. However, in order to make conclusions about general population, it is necessary: 1) to increase the number of participants in each experimental condition, and 2) to analyze whether and how post-test performance is affected by the quantity of target items circled during the test.

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