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MODALITY AND ATTENTION TO MEANING AND FORM IN THE INPUT

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VanPatten (1990) found that L2 learners of Spanish have difficulty simultaneously attending to meaning and form of aural input. This partial replication of VanPatten (1990) addresses the effect of modality on attention to meaning and form by including a written mode and by using a different L2, that is, English as a foreign language. Six tasks were used in this study: (a) listening to the passage for content only, (b) listening for content while attending to the content word *inflation*, (c) listening for content while attending to the definite article *the*, (d) reading the passage for content only, (e) reading the passage for content while attending to the content word *inflation*, and (f) reading for content while attending to the definite article *the*. Task results in the aural mode mirrored those of VanPatten's original study, but significant differences were not observed for tasks in the written mode. Furthermore, results revealed that listening was more difficult than reading, suggesting that modality is a variable that influences how learners process input. Avenues for future research are discussed.

The role of attention in language processing has become the focus of a rich corpus of recent second language acquisition studies. As the field of SLA enters the new millennium, it is becoming increasingly clear that the role of at-

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tention is as important to understanding SLA as the role of input is. As summarized by Schmidt (in press), it is now recognized that attention is a necessary construct for understanding virtually every aspect of SLA.

Two key issues surrounding the role of attention in SLA are (a) whether learners must actually attend to features of the input in order for them to become intake and (b) whether learners must also be aware of attending to specific forms in the input. There is evidence in the SLA literature to suggest that some form of attention to input is crucial or at least advantageous for intake derivation (e.g., Alanen, 1995; Leow, 1997, 1998a, 1998b; Long, 1991; VanPatten & Cadierno, 1993; White, 1998). The role of awareness in attention, however, is less clear and remains a topic of debate. Schmidt (1990, 1993, 1994, 1995), for example, postulated that learners must consciously notice and be aware of features of input in order for intake and learning to be possible. Tomlin and Villa (1994), on the other hand, argued that although attending to input is necessary, awareness may be dissociated from attention and is consequently not necessary for learning (for a review of Tomlin and Villa's work, see Simard & Wong, 2001). Owing to methodological difficulties associated with operationalizing awareness and absence of awareness in SLA, both Schmidt's and Tomlin and Villa's positions remain difficult to validate. However, though the issue of awareness remains a challenge to untangle, we cannot ignore the growing body of research in SLA that demonstrates that a greater degree of attention, and in some cases also awareness, leads to more learning (Jourdenais, Ota, Stauffer, Boyson, & Doughty, 1995; Leow, 1997, 1998b; Robinson, 1996a, 1996b; Rosa & O'Neill, 1999; Schmidt, in press; Schmidt & Frota, 1986; White, 1998). Thus, no matter what position one takes on the awareness issue, there is a general consensus that attention to input is a crucial construct for SLA.

An empirical study that has had an important impact on the attention research in SLA is VanPatten (1990). In this study, VanPatten demonstrated that it is difficult for L2 learners of Spanish to simultaneously pay attention to meaning and form in aural input, particularly when the grammatical form is not crucial for understanding the propositional content of the message. In bringing out this difficulty, SLA researchers are taking up the challenge to find ways to help learners pay attention to both meaning and form, which has resulted in a growth of research on input enhancement (e.g., Alanen, 1995; Doughty, 1991; Jourdenais et al., 1995; Leeman, Arteagoitia, Fridman, & Doughty, 1995; Leow, 1993, 1998a; Overstreet, 1998; Robinson, 1996a, 1996b; Sharwood Smith, 1991, 1993; Shook, 1994; White, 1996, 1998). The impact of VanPatten (1990) on the attention literature in SLA is evident, as this study has been cited in virtually every recent focus on form study (see the volume edited by Doughty & Williams, 1998). However, it must be noted that VanPatten (1990) only addressed the aural mode and Spanish L2 data. Whether the difficulty of focusing on form and meaning holds to the same degree in the written mode still needs to be examined. This study, a partial replication of

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VanPatten (1990) in English as a foreign language, was designed to address this question.

THEORETICAL FRAMEWORK OF VANPATTEN (1990)

VanPatten (1990) was motivated by the perspective in cognitive psychology that attention is effortful and that humans have a limited capacity to deal with stimuli (e.g., Broadbent, 1958; Kahneman, 1973; Wickens, 1984). Given this limited attentional capacity, it follows that only a limited amount of incoming data may be attended to at a given time. Thus, VanPatten proposed that form and meaning may compete for attentional resources during online input processing. Furthermore, because the communicative goal of learners is to understand the propositional content of messages rather than to try to understand how that message is encoded, VanPatten (1990) postulated that learners will tend to process input for meaning before they do so for form. This idea was further developed by VanPatten in subsequent work, resulting in what is now known as VanPatten's model of input processing (1994, 1996).[1] Based on the idea that learners are limited-capacity processors of information and that language comprehension consumes a great deal of attentional resources, the principles in the model postulate that in the early and intermediate stages of L2 acquisition, learners will first process input for meaning via content lexical items. Only after comprehension has been automatized will learners have attentional resources left over to also allow them to focus on the forms in which messages are encoded. Thus, VanPatten (1990) proposed that if subjects under experimental conditions were directed to attend to form while also processing the input for meaning, then there should be a negative effect on comprehension (p. 290). In the same vein, if learners are processing input for meaning first, then a task involving attention to important lexical items should not affect comprehension of content.[2]

Subjects in VanPatten's (1990) study were from three levels of a university Spanish course separated into four groups. While a text was read to them, each group was required to perform one of four tasks:

> Task 1: listening to the text for content only (control task)
>
> Task 2: listening to the text for content and for the content word *inflación* "inflation" at the same time by making a check mark each time *inflación* is heard
>
> Task 3: listening to the text for content and for the definite article *la* at the same time by making a check mark each time *la* is heard
>
> Task 4: listening to the text for content and for the verb morpheme *-n* at the same time by making a check mark each time the verb morpheme *-n* is heard

VanPatten found that task 1 (content only) and task 2 (content plus lexical item *inflación*) produced the highest recall scores, and there was no significant difference between them. There was also no significant difference be-

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tween task 3 (content plus definite article *la*) and task 4 (content plus verb morpheme *-n*). However, there was a significant difference between scores on tasks 1 and 3, and between 1 and 4, as well as between 2 and 3, and 2 and 4. Thus, as predicted, attending to grammatico-morphological forms in the input that do not play a crucial role in interpreting the content of the message negatively affected comprehension, whereas attention to important lexical items did not affect comprehension of content. Overall, VanPatten's results also showed that higher recall scores were associated with higher levels of proficiency. Thus, VanPatten offered evidence to conclude that attention to form in the input competes with attention to meaning, and by extension, that "only when input is easily understood can learners attend to form as part of the intake process" (p. 296).

Bransdorfer (1991) used attention tasks similar to the ones used by VanPatten (1990), but with different linguistic items, and obtained results that were consistent with the original VanPatten study. Bransdorfer found that attending to a lexical item of high communicative value (*exámenes* "exams") while listening to a passage for content did not negatively affect comprehension, but attending to a form of low communicative value (the copular verb *está* "is") resulted in a drop in comprehension. However, one difference between the two studies is that whereas VanPatten also found significant differences between attending to a lexical item of high communicative value (*inflación)* plus content and attending to items of low communicative value (the definite article *la* and the verb morpheme *-n*) plus content, Bransdorfer did not observe any significant differences between attention to content plus an item classified as high in communicative value (*exámenes*), and attention to content and to an item classified as low in communicative value (*está*). Bransdorfer attributed the different results to the similar phonological properties of the linguistic items *exámenes* and *está*. Although these differ in communicative value, both items are multisyllabic and carry primary stress. In VanPatten's study, *inflación* is acoustically salient but the grammatical items *la* and *-n* do not carry stress. Thus, Bransdorfer supports and expands on VanPatten's findings by demonstrating that communicative value may interact with acoustic salience in input processing. Items with low communicative value that are acoustically salient may be more easily processed than items of low communicative value that are not acoustically salient (Bransdorfer, p. 138).

Another critical point that VanPatten (1990) brought out is that the issue of attention to form in the input is only an issue when the input involves meaning-bearing input—that is, input that learners must attend to for its propositional content. This meaning-bearing input, according to VanPatten, does not include explicit information about the properties of the L2 itself. He pointed out that anyone can focus on either meaning or form; the critical question is whether one can pay attention to both meaning and form at the same time and how this can be facilitated when it is difficult to do so. Thus, VanPatten made a further contribution to the research on attention and SLA by pushing for research paradigms that include assessments of both meaning

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and form. A handful of recent studies motivated by these findings have examined the processing of input for both meaning and form. I will review this research in the following section.

PREVIOUS RESEARCH ON INPUT AND MODALITY

Research on Processing Input for Meaning and Form

Leow (1997) examined the effects of text length and textual enhancement on learners' comprehension of text content and intake of the impersonal imperative forms of Spanish verbs. Second-semester college-level learners of Spanish were exposed to one of four conditions: a long, nonenhanced text; a long, enhanced text; a short, nonenhanced text; and a short, enhanced text. Comprehension was assessed via a short-answer comprehension task in the subjects' L1, and intake was measured through a multiple-choice recognition task. Leow found a main effect for text length on comprehension but not on the intake of forms. There was no significant effect for textual enhancement on either comprehension or intake. Leow concluded that although the use of shorter authentic texts might be useful in developing beginning learners' reading comprehension, shorter texts do not necessarily promote the intake of linguistic forms.

Lee (1998) also examined intake and comprehension in the written mode. Lee set out to investigate how morphological characteristics of Spanish verbs in a reading passage might affect comprehension and intake of forms. Learners in this study were exposed to one of three versions of a reading passage. The first version contained regular verb forms of the present subjunctive; the second contained infinitive forms of the verbs; and in the third version, all subjunctive endings were replaced by the invented morpheme *-u*. Comprehension was assessed through written recalls in the learners' L1, and intake was measured via a word-recognition task. Results showed that all three groups were equally successful in identifying the forms. However, those who read the text that contained the regular subjunctive forms had significantly lower comprehension recall scores than the learners who read the versions with the infinitive and invented forms. Lee concluded that the lower recall scores were due to the greater variability of the regular subjunctive verb forms. He proposed that the richer morphological endings of the regular subjunctive forms required more cognitive effort to process them, which resulted in a negative effect on comprehension.

Overstreet (1998) used content familiarity, the story of Little Red Riding Hood, to reduce cognitive effort. The motivation behind this was that reading a familiar text would require fewer attentional resources to comprehend the text and would consequently leave more resources available for the processing of form. Textual enhancement was further used as a form of input enhancement to draw learners' attention to the target features: the preterit and imperfect tenses in Spanish. Third-semester Spanish students were directed

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to read a text under one of four conditions: enhanced, familiar content; enhanced, unfamiliar content; unenhanced, familiar content; and unenhanced, unfamiliar content. Comprehension was measured through a true-false comprehension quiz in the subjects' L2, and intake was assessed via a narration task and a circle-the-verb task. Overstreet did not find positive effects for either content familiarity or textual enhancement on either subjects' intake of the target features or on comprehension. However, a negative effect for textual enhancement on comprehension was found, which led Overstreet to conclude that drawing learners' attention to forms in written input can interfere with learners' ability to process input for meaning.

The studies reviewed suggest that in single-exposure research designs in which both comprehension and intake are assessed, the manipulation of written input does not have any effect on learners' intake of form, as measured by certain kinds of postexposure tasks. However, the findings suggest that manipulating features of written input can have either positive or negative effects on comprehension. Shorter texts appear to increase comprehension (Leow, 1997), whereas morphological variability (Lee, 1998) and textual enhancement (Overstreet, 1998) may interfere with it. Thus, based on these studies, there is evidence to suggest that the tension between attention to meaning and form that VanPatten (1990) found in the aural mode may also exist in the written mode. However, the issue of modality and attention as a variable has not been adequately examined in SLA studies. This issue merits extensive investigation given that there is evidence from psychological and L1 research, as well as from a few SLA studies, to suggest that attentional constraints during input processing may not be the same for the aural and written modes.

Research on Modality

Psychological Research. In the domain of cognitive psychology, there is evidence to suggest that the modality of input presentation has an effect on general human information processing (Broadbent, Vines, & Broadbent, 1978; Penney, 1989; Rollins & Hendricks, 1980; Shaffer, 1975; Treisman, 1969). Treisman, for example, proposed a model of attention in which the modality of presentation and the type of analysis are considered important variables in determining whether selective-attention effects will occur. According to Treisman, whether processing two independent messages will interfere with each other depends on whether the same or different modalities are needed to process the messages. For example, when subjects must analyze two messages presented in the same modality, then the two tasks should interfere with each other because both messages must compete for access to the same analysis mechanism. If, on the other hand, the two messages are presented to different modalities, then both can be processed without interference because different analyzer systems are accessed.

Support for Treisman's (1969) model can be found in empirical studies such as Dennis (1977). This study had subjects perform a primary task in

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which they had to listen to a message while at the same time performing a detection task that required them to monitor a list of words presented either aurally or visually. Dennis found that there were more errors on the detection task for those who received the word list aurally than for those who received it visually. Thus, as Treisman proposed, dual-task performance interference is observed when subjects must perform two tasks simultaneously in the same modality but not when the two tasks are presented in two different modalities.

Penney (1989) found that the modality of presentation can influence how subjects organize information. It was observed that subjects preferred to recall information based on the modality of presentation before other criteria. Penney found that when stimuli were presented in two modalities, two languages, and according to different semantic categories, subjects preferred to recall the stimuli based on the modality of presentation rather than on the language of presentation or according to semantic category. (See Penney for a more detailed review on modality effects and memory.)

L1 Research. L1 research has investigated the differences between reading and listening to texts. This line of research has often brought out advantages for the written mode. Danks (1980), for example, stated that readers have complete control over the amount and rate at which they process visual input because written input is constantly available for reprocessing. Listeners, on the other hand, do not have this control because speech is continuous and auditory signals fade rapidly (Danks, p. 2). Anderson (1980) has emphasized that in the written mode, input is neatly segmented into units—that is, words, sentences, and paragraphs—whereas in the aural mode listeners must rely on prosodic and intonational cues, a task that may heavily tax processing resources. Sticht and James (1984) have pointed out that age can be a key factor in determining which modality may be more advantageous for receiving input. They noted that children who have not fully developed literacy skills tend to perform better on listening rather than reading tasks. Adults, on the other hand, tend to perform better on written rather than aural tasks. Finally, Rost (1990) observed that readers have greater control over reading tasks because they have the option of focusing or ignoring certain features of the input and of rereading the text if necessary. In the aural mode, this is not possible because listeners are required to perceive and decode input simultaneously.

L2 Research. In the field of SLA, a small number of empirical studies have investigated modality effects. In Johnson (1992), the issue of modality was addressed as a factor that might influence ESL subjects' performances on grammaticality judgment tasks. Johnson set out to examine if Johnson and Newport's (1989) conclusion that there is a critical period effect for language acquisition with L2 learners was due to modality effects. In Johnson and Newport's original study, the researchers used an aural grammaticality judgment task to make their claim that children have an advantage over adults in acquiring an L2. Johnson's follow-up study to Johnson and Newport's research used the same subjects but employed a written instead of an aural grammaticality

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judgment task. Johnson found that the written results for the adults (but not for the children) were markedly higher than their previous aural results, which led the researcher to conclude that adult L2 learners may have grammatical knowledge that is available to them in performing reading and written tasks that may not always be available during speech production or processing tasks (Johnson, pp. 246–247).

Murphy (1997) also addressed the issue of modality and performance on grammaticality judgment tasks, specifically within the context of research on universal grammar and SLA. Murphy proposed that factors independent of the linguistic structure under investigation could affect learners' performance on metalinguistic tasks. Murphy investigated four language groups: English L2, French L2, English L1, and French L1. Subjects were assigned to either an aural or visual grammaticality judgment task. Reaction time and accuracy on the tasks were measured. Results revealed that subjects in the aural condition were slower and less accurate in making their judgments than subjects in the written condition, with detrimental effects on the auditory task being the most pronounced for the L2 learners. Murphy concluded that research presenting tasks in only one modality may not be obtaining a complete picture of what processes or knowledge learners have available to them in performing grammaticality judgment tasks. Murphy pushed for research designs that use tasks presented in different modalities in order to increase the validity of results.

Lund (1991) compared the recall performances of three levels of L2 German learners' comprehension of a German text that was presented either aurally or visually. Lund found that, overall, learners in the written condition (at all three levels) recalled more propositions and comparatively more detail than did those in the aural condition. Those in the aural condition, on the other hand, recalled proportionally more main ideas than those in the written condition. The listeners were also observed to have invented ideas—that were plausible but not present in the text—to a greater degree than those in the written condition (Lund, p. 200). Lund concluded that this study offers evidence to suggest that the nature of the modality can influence how listeners and readers approach a comprehension task (p. 201).

Leow (1993) examined the effects of simplified written input on the intake of Spanish present perfect and subjunctive verb forms. The results of this study did not demonstrate that simplification of written input increased the intake of linguistic items. Leow (1993) proposed that the lack of effect found for input simplification could be due to the fact that learners are less cognitively constrained in the written mode than they are in the aural mode. To test the hypothesis that modality could affect intake, Leow (1995) replicated the 1993 study in the aural mode and found a significant effect for type of linguistic item. In the aural mode, a significantly greater number of present perfect forms were taken in compared to the present subjunctive forms. He pushed for research that directly compares input processing in the written and aural modes.

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Therefore, based on the findings from psychology, L1 research, and SLA studies on modality, one can conclude that attention to meaning and form may not be constrained in the same way in the written and aural modes. The research reviewed, particularly the L2 studies, suggests that the processing of aural input is more effortful and consequently requires more attentional resources to process than written input. By extension, the difficulty that L2 learners experience when input must be processed simultaneously for meaning and form (VanPatten, 1990) should be greater in the aural mode than in the written mode. Thus, research that investigates processing input for both meaning and form needs to address modality effects.

A partial replication of VanPatten (1990) was recently conducted by Greenslade, Bouden, and Sanz (1999), who changed the input mode from aural to written and obtained a pattern of results similar to the original VanPatten study, providing evidence to support the idea that form and meaning may compete for attentional resources in the processing of written input. However, whether the tension between attention to meaning and form is present to the same degree in the written and aural modes and whether this phenomenon holds across different L2s have not been adequately examined. Greenslade et al. compared their data with VanPatten's data and found significant differences between the mean scores of the two different subject pools. They found that the recall percentages for their study in the written mode were substantially higher than those reported in the VanPatten study, which suggests that learners are less cognitively constrained in the written mode. However, as Greenslade et al. pointed out, because the subjects in their study and the subjects in VanPatten's study came from two different institutions and two different research designs, the difference in means may be attributable to differences between the two groups of learners and the different institutions at which the studies were conducted. A research design that directly compares the aural and written modes and that uses subjects from the same subject pool would allow for stronger claims as to whether the differences were indeed due to modality. Furthermore, both VanPatten and Greenslade et al., as well as most of the studies reviewed above, focused on L2 data from Spanish. Whether their results will hold across different languages has not yet been examined.

THE STUDY

To further focus SLA research on modality effects and input processing, this study replicates VanPatten (1990) in the aural and written modes but differs from the Greenslade et al. (1999) replication in that it directly compares the written and aural modes within the same research design and focuses on French learners' acquisition of English as a foreign language. Owing to the availability of subjects, only one level of learners was used, and the fourth treatment condition of VanPatten's study (attention to meaning and to a bound morpheme) was omitted.

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Hypotheses

Based on VanPatten's (1990) original study and the idea that modality affects how attention is constrained, the following hypotheses were formulated:

1. Requiring listeners to attend to a definite article in the input will negatively affect comprehension.
2. Requiring listeners to attend to a content lexical item that is important for understanding the referential meaning of the passage will not negatively affect comprehension.
3. Requiring readers to attend to a definite article in the input will negatively affect comprehension.
4. Requiring readers to attend to a content lexical item that is important for understanding the referential meaning of the passage will not negatively affect comprehension.
5. Requiring learners to pay attention to either a content lexical item or to a definite article will differentially affect comprehension depending on the mode (aural vs. written).

Participants

The participants in this study were initially 85 low-intermediate, college-level, English as a foreign language students at Université Laval in Quebec. Five course sections of this level were used with three different instructors. The L1 of all participants was French. Intact classes were used with instructors' and students' consent. The curriculum was communicative in nature with emphasis on all four skills.

Based on the criteria used in VanPatten's (1990) original study, subjects were required to detect a minimum of 60% of the target items in order to be included in the subject pool. There was a total of 10 tokens of the target item *the* and 11 tokens of the target item *inflation*. Six subjects failed to meet this criterion and were removed, resulting in a final total of 79 subjects for the study.

Procedure

The researcher, who was also the instructor for two of the sections, administered the study. The passage that VanPatten (1990) used in his original study (see Appendix A) was translated into English by a bilingual English-Spanish speaker and was used for both the aural and written conditions (see Appendix B). A shorter passage that was used as a warm-up exercise was administered prior to the test passage and was not scored (see Appendix C). Participants in each of the five course sections were randomly assigned to one of six tasks:

Task 1: listening to the passage for content only

Task 2: listening for content while attending to the content word *inflation*

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Task 3: listening for content while attending to the definite article *the*

Task 4: reading the passage for content only

Task 5: reading for content while attending to the content word *inflation*

Task 6: reading for content while attending to the definite article *the*

Following VanPatten's (1990) procedure, participants first performed their tasks with the warm-up passage. After this warm-up exercise, the real experiment began. To activate background knowledge, all participants were told that the passage would be about the problems of inflation in Latin America. Additionally, they were told that they would be asked to recall details of the passage after reading or listening to it.

Participants in the three aural conditions listened to the test passage recorded by a native speaker of English and played from a tape recorder. The total time for listening to the test passage was 2 minutes and 30 seconds. Following VanPatten's (1990) procedure, participants with task 1 listened to the passage for meaning only, participants with task 2 listened for meaning and for the word *inflation*, and those who had task 3 had to listen for meaning and for the definite article *the*. Attention to form was operationalized by requiring participants to put a check mark on a piece of paper every time they heard their target word in the passage.[3] Following this focusing task, all participants had a maximum of 10 minutes to write down everything they could remember about the passage in their L1, French. All participants completed the recall task before the 10-minute time limit. The rationale for using L1 in the free recalls was based on Lee (1986), who found that written recalls in the L1 reflected participants' actual comprehension more accurately. The same procedure was followed for the three written tasks, with the difference being that instead of listening to the passages, participants had the text in front of them to read and were asked to attend to specific items in the written input. Attention to form was operationalized by having participants underline or circle the occurrences of the target item on the copy of their text. Subjects were then asked to write at the bottom of the page the number of times each target item appeared. To ensure that any differences found between the written and aural tasks were indeed due to modality effects and not due to difference of time on task, participants in the written conditions were given the same amount of time to read their texts as the subjects in the aural conditions had to listen to the passage, 2 minutes and 30 seconds. Following the reading activity, subjects performed the free recall exercise.[4]

Scoring and Analysis

Recall protocols were scored according to the number of idea units recalled. The total possible number of idea units for the test passage was 52 (see Appendix D). As with VanPatten's (1990) original test passage, the translated version used in this present study was broken down into idea units based on

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Table 1. Number of participants and mean recall scores per task

Task	Participants (*n*)	Mean recall	*SD*
Aural			
1. Content only	16	9.438	5.440
2. Content + *inflation*	17	7.412	3.792
3. Content + *the*	12	2.167	1.899
Written			
4. Content only	12	13.500	5.600
5. Content + *inflation*	12	12.250	4.883
6. Content + *the*	10	12.200	4.467

Table 2. ANOVA for recall scores

Source	*df*	*SS*	*MS*	*F*	*p*
Mode	1	760.622	760.622	37.003	<.0001
Task	2	224.384	112.192	5.458	.0062
Mode × Task	2	123.954	61.977	3.015	.0552
Residual	73	1500.572	20.556		

syntactic and semantic features (Carrell, 1985; Lee, 1986). Each participant's score consisted of the raw number of idea units recalled. (See Appendix E for example scoring.) The recall protocols were scored by the researcher using a blind scoring procedure.[5] After data from all six task groups were scored, mean recall scores for each group were calculated.

RESULTS

The number of subjects and mean scores per task are displayed in Table 1. Looking at the means within each mode, one can see a consistent pattern. Participants who had to pay attention to content only produced the highest recalls, followed by those who had to pay attention to content and *inflation*, and those who had to pay attention to content and *the* obtained the lowest recall scores. Another difference that can be observed from the table of means is that all of the scores in the written mode are higher than those in the aural mode.

All scores were submitted to an analysis of variance (ANOVA), the results of which are reported in Table 2. A significant main effect was found for Mode, $F(1, 78) = 37.003$, $p < .0001$, and for Task, $F(2, 78) = 5.458$, $p < .05$. The interaction between Mode and Task was nonsignificant, although it approached significance, $F(2, 78) = 3.015$, $p = .0552$. Fisher's PLSD with alpha set at the .05 level revealed that the main effect for Mode was due to the participants in the

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Table 3. Fisher's PLSD for task

Tasks	Mean difference	Critical difference	*p*
Content only, Content + *inflation*	1.765	2.394	.1461
Content only, Content + *the*	4.451	2.574	.0009
Content + *inflation*, Content + *the*	2.687	2.555	.0396

Table 4. GLM ANOVA with selected contrasts

Contrast	*df*	Contrast *SS*	*MS*	*F*	*p*
Aural mode					
Content vs. Content + *inflation*	1	33.82	33.82	1.65	.2036
Content vs. Content + *the*	1	362.50	362.50	17.64	<.0001
Content + *inflation* vs. Content + *the*	1	193.53	193.53	9.41	.0030
Written mode					
Content vs. Content + *inflation*	1	9.37	9.37	.46	.5016
Content vs. Content + *the*	1	9.22	9.22	.45	.5052
Content + *inflation* vs. Content + *the*	1	.01	.01	.00	.9795

written groups performing better than those in the aural groups ($p < .0001$). Table 3 shows that, overall, the main effect for Task was due to the significant difference between the scores of the *content only* and the *content + the* tasks and the difference between the scores of the *content + inflation* and the *content + the* tasks. There was no significant difference between the *content only* and the *content + inflation* tasks. To determine which pairwise cell condition was contributing to the significance found for Task, a post hoc pairwise comparison using error as the denominator was performed using the SAS general linear model (GLM) procedure. As reported in Table 4, this analysis revealed that the effect for Task was due to the significant difference between the scores of the *content only* task and the *content + the* task and the difference between the *content + inflation* task and the *content + the* task in the aural mode only. The pairwise comparison showed no significant differences for the tasks in the written condition. The approaching interaction between Mode and Task suggests that the amount of difference between tasks was a function of mode.

In short, the task differences in the aural conditions mirrored the results of VanPatten (1990), who found no significant difference between paying attention to *meaning only* and *meaning + inflación* but found a significant difference between paying attention to *meaning only* and *meaning + la* and between pay-

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ing attention to *meaning + inflación* and *meaning + la*. These results, however, were not observed for the written mode.

DISCUSSION

The results of the aural mode tasks lend support to VanPatten's (1990) original study and partially confirm the hypotheses formulated for this study. In accordance with the findings of VanPatten (1990) and his model of input processing (1994, 1996), it appears that at the early stages of acquisition, form and meaning compete for learners' limited attentional resources during input processing in the aural mode with a preference for processing meaning before form. As a result, and confirming hypothesis 1 of this study, when learners were directed to pay attention to a definite article in aural input, comprehension of that input was necessarily inhibited. However, when learners' attention was oriented to a lexical item in the aural input that was crucial for comprehending the referential meaning of the passage, there was no detrimental effect on comprehension, confirming hypothesis 2.

In the written mode, only hypothesis 4 was confirmed. Requiring readers to attend to a lexical item that was important for understanding the referential meaning of the passage did not negatively affect comprehension. There was no significant difference in recall between readers who had to attend to the content word *inflation* and those who read the text for content only. However, contrary to what was predicted for hypothesis 3, requiring readers to attend to a definite article did not negatively affect comprehension, either. The number of idea units recalled by readers who had to pay attention to *the* in the input was not significantly less than those who read the passage for content only or for those who had to attend to the lexical item *inflation*. As revealed by the post hoc pairwise comparisons, there were no significant differences in recall scores between any of the tasks in the written mode. Attending to *the* and content in the written input was not more difficult than attending to the content word *inflation* and content or to content only.

Hypothesis 5 of this study was confirmed. Requiring learners to simultaneously attend to both the propositional meaning of the text and to form (the definite article) did not affect the aural and written modes to the same degree. As the results of Fisher's PLSD and the main effect for Mode show, performance in the written mode was significantly better than performance in the aural mode, which suggests that learners' limited attentional capacity is not constrained in the same way during input processing in the aural and written modes. Comprehension, as measured by free recalls, was better when the input was written than when it was aural. Furthermore, the approaching interaction observed between Mode and Task suggests that the amount of information recalled by participants in each task was a function of whether they were performing their task in the aural or in the written mode. When the mode was aural, attending to propositional meaning and to form at the same time impeded comprehension, but when the mode was written, attending to

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propositional content and to form simultaneously did not negatively affect comprehension.

The finding that attending to form and meaning at the same time did not significantly impede reading comprehension contradicts the results found by Greenslade et al. (1999). In their replication of VanPatten's (1990) study in the written mode, Greenslade et al. found that attention to grammatical form in the written mode negatively affected comprehension, whereas attention to a lexical item did not significantly impede comprehension. There is presently no clear-cut explanation for the contradictory results of these two replications of VanPatten's study in the written mode. Because the amount of time that the participants had to read their text in both replication studies was two and a half minutes, reading time was not a contributing factor to the contradictory results. The fact that English was the L2 used in this study also does not offer an explanation, given that significant differences were found for the aural tasks in this study and mirrored the results of VanPatten's study. Another explanation could be that one set of participants in one study may have performed in a purer sense of what they were expected to do than those in the other study (R. Leow, personal communication, November 11, 1999). For example, it is possible that participants in the *content only* group and the *inflation + content* group were attending to other things in the written input in addition to their target words. This in turn may have exhausted more of their attentional resources and consequently negated any advantages for attention to a high communicative value lexical item over attention to form. However, without online think-aloud protocol data, this possibility remains speculative.

Despite the contradictory results of Greenslade et al.'s (1999) study, this study is able to draw conclusions in regards to the issue of modality and attention to meaning and form. Contrary to Greenslade et al., who only replicated VanPatten (1990) in the written mode, this study directly compared both the aural and written modes in the same research design and found that, although participants could not simultaneously pay attention to meaning and form without sacrificing comprehension when the input was aural, they were able to do so without detrimental effects to comprehension when the input was written. Because reading was easier than listening for the participants in this study (as demonstrated by the main effect for Mode), it appears that paying attention to both content and to a definite article did not impede comprehension in reading as it did when the input was aural.

This finding is not surprising, given the evidence reviewed earlier in adult L1 and L2 studies showing performance advantages for the written over the aural mode (Danks, 1980; Johnson 1992; Lund, 1991; Murphy, 1997; Rost, 1990). As these studies have suggested, processing written input may be relatively less taxing on learners' limited attentional resources because written input is neatly segmented and readers have the advantage of assuming greater control over the input—that is, rereading, skimming, and focusing on specific features of input over others.

Thus, given that attention is not constrained to the same degree in the

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aural and written modes, research on attention and input processing needs to include assessment tasks in both modes to obtain a more complete and accurate picture of the role of attention in SLA.

CONCLUSION AND FUTURE RESEARCH

The findings from the aural tasks of this study support VanPatten's (1990) conclusion that form and meaning compete for learners' limited attentional resources during the early stages of L2 acquisition, which results in detrimental effects for comprehension when attention is allocated to focus on a grammatical form. This study expands on VanPatten's results by showing that the tension between focusing on meaning and form also holds for a different L2 (English) in the aural mode. Finally, this study contributes to research on modality effects and SLA by showing that attentional constraints do not affect the aural and written modes in the same way. In the aural mode, comprehension was sacrificed when learners were directed to pay attention to form. However, when the mode was written, paying attention to form did not result in detrimental effects for comprehension.

The results of this study have implications for focus on form research in SLA, particularly textual enhancement as a form of input enhancement. In general, textual enhancement involves manipulating typographical features of written input to draw learners' attention to target forms as they read a text for meaning (Wong & Simard, 1999). The question of how drawing attention to form might affect how learners process written input for meaning has not been explored adequately in textual enhancement studies (Alanen, 1995; Jourdenais et al., 1995; Leeman et al., 1995; Shook, 1994; White, 1998). Of the existing textual enhancement studies, only Leow (1997) and Overstreet (1998) isolated textual enhancement as a variable and assessed its impact on comprehension. Leow found no effect for textual enhancement on comprehension, whereas Overstreet observed a negative effect. Overstreet used the findings of VanPatten (1990) to explain the negative effect on comprehension: Attention to the typographically enhanced forms in the written input exhausted attentional resources needed to attend to meaning, creating a detrimental effect on comprehension (Overstreet, p. 247). The results of this present study, as well as Leow's finding that textual enhancement did not impede comprehension, suggest that the relationship between attention to meaning and form in the written mode may be more complex. These findings also suggest that attention to form in the written mode does not necessarily impede comprehension and that other factors need to be considered. One of these factors is the nature of the form that learners are directed to pay attention to. As pointed out by Wong and Simard (1999), given that not all features of an L2 require the same amount of attention to process, textual enhancement cannot be expected to have the same impact on all types of forms. The amount of attention needed to process a particular form may be dependent on properties such as

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the degree of the form's communicative value (VanPatten, 1994, 1996) and the degree of its perceptual saliency in the written input (Bransdorfer, 1991).

Another factor that could influence the effects of textual enhancement concerns the type or combination of types of typographical cues used to draw attention to form (Wong & Simard, 1999). According to Simard (1999), certain types of typographical cues may not be sufficiently perceptually salient to have an impact on intake, whereas other combinations of cues could result in a sensory overload and impede input processing, such as Overstreet's (1998) use of five different typographical cues (i.e., underlining, bolding, enlarging, shadowing, font alteration). Furthermore, most textual enhancement and other attention research in SLA cannot tell us whether learners are paying attention to other things in the input in addition to the target forms, things that may also have an effect on how attentional resources are allocated (Leow, 2000). Including think-aloud protocols might provide us with a clearer picture of the relationship between attention to meaning and form during input processing (Leow).

In conclusion, this study has contributed to the research on attention and SLA by showing that modality can affect input processing. However, many questions remain to be addressed by future research. In this replication study, the definite article *the* and a content word that was important for processing the referential meaning of the passage, *inflation*, were used. Future research must examine modality effects and attention related to other aspects of language such as syntax, morphology, content words that are not important for understanding the message, and linguistic items of different degrees of perceptual salience. Furthermore, it must be noted that in the original VanPatten (1990) study and in this study, the lexical items *inflación* and *inflation* are cognates with regard to the participants' L1 and L2. In Bransdorfer's (1991) study, the item of high communicative value, *exámenes*, is also a cognate of the English word *exams*. Thus, it may be possible that participants found it easier to pay attention to meaning and to a content lexical item because the lexical item was a cognate rather than because it was an item of high communicative value. To tease out the effect of communicative value on input processing more adequately, future studies should select target items that are not cognates with respect to the participants' L1 and L2. Additionally, given that simultaneous attention to meaning and form becomes easier as proficiency level increases (VanPatten) and that children tend to perform better in the aural than the written mode (Sticht & James, 1984), subsequent research should address how different proficiency levels and age might affect input processing in one modality versus another. Finally, if detection of input is the necessary and sufficient condition for intake (Tomlin & Villa, 1994; Wong & Simard, 2001), research must determine whether the detected target items do indeed lead to further processing, by including some kind of assessment of the detected forms in both modalities.[6]

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NOTES

1. VanPatten's model analyzes input in terms of attentional processes and provides a set of principles and subprinciples to explain how learners allocate attention to input and why. The first two principles (VanPatten, 1996, pp. 14–15) given in (i) and (ii) are relevant to the present study.

(i) P1. Learners process input for meaning before they process it for form.
  P1 (a). Learners process content words in the input before anything else.
  P1 (b). Learners prefer processing lexical items to grammatical items for semantic information.
  P1 (c). Learners prefer processing "more meaningful" morphology before "less" or "nonmeaningful morphology."

(ii) P2. For learners to process form that is not meaningful, they must be able to process informational or communicative content at no (or little) cost to attention.

2. Meaning is defined by VanPatten (1990) as the referential meaning and content lexical items of a message. Form refers to surface features of language, which include verbal and nominal morphology (i.e., inflections) and functional items such as prepositions, articles, pronouns, and other "noncontent" words.

3. One anonymous reviewer commented that the process involved in noticing for intake or acquisition is not likely to be the same as that required for listening or reading and making a tick or underlining. Operationalizing noticing or attention to form remains a challenge for researchers because there is no consensus to date as to what processes are actually involved in noticing for intake and acquisition. The ticking procedure was used in the original VanPatten (1990) study and in the present study because it allowed the researchers to measure online attention to form and served the purposes of the studies. Research should continue to investigate the processes that may be involved in attention as well as to explore different ways of operationalizing attending to form as a construct for intake.

4. One reviewer pointed out that free-recall tasks may not be the best measure of comprehension because they are biased toward rewarding for detail. Because this study replicates VanPatten's (1990) original study, the free-recall task had to be used in order to compare results. Furthermore, this task has been widely used in the literature as a comprehension measure (e.g., Bernhardt, 1983, 1991; Carrell, 1983, 1985, 1990; Lee, 1986; Lee & Ballman, 1987). Future studies should attempt to incorporate a triangulation of different comprehension tasks.

5. Given that all the recall data were scored by the researcher, there was no interrater reliability data collected.

6. A reviewer pointed out that intake was not assessed in this study. The goal of this experiment was to show how comprehension may be affected when learners are pushed to allocate their attentional resources to grammatical form. Whether detection of the target items leads to further processing of those items is an interesting question that future studies should address.

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APPENDIX A

PASSAGE FROM ORIGINAL VANPATTEN (1990) STUDY

Total words in passage: 274

Total sentences: 17

Average words per sentence: 16.11

La Inflación

Uno de los problemas más graves en los países latino americanos es la inflación. Claro, en los Estados Unidos la inflación también es un problema, pero no es tan elevada como la inflación de algunos de los países hispanos. Como los Estados Unidos sufre de une inflación de 2–3%, un país como Chile cuenta con 30% y la inflación en la Argentina es ahora 200%.

Cómo afecta la inflación a la gente? La inflación afecta a todos, sobre todo a la clase trabajadora. Sus salarios muchas veces no son suficientes para comprar las cosas básicas. Es un círculo vicioso porque cada vez que suben los salarios, suben los precios también. Cuando los precios suben es necesario aumentar los salarios otra vez. Así la inflación está constantemente alta.

En una situación económica como ésta, es casi imposible poner dinero en el banco: primero porque la gente tiene que pagar más para vivir y no tiene dinero para poner en el banco; y segundo porque no es buena idea ahorrar nada en estas circunstancias. La gente cree que en vez de ahorrar dinero, es mejor invertirlo en cosas que no pierden su valor. Etonces, las personas que tienen suficiente dinero lo invierten en propiedades y otras cosas que mantienen un valor constante. Y si no tienen mucho dinero, compran televisores, ropa o aparatos eléctricos porque saben que en poco tiempo los precios de estos artículos van a ser aán más altos.

No sabemos muy bien del futuro economíco de Latino américa respecto a la inflación. Con los problemas de la industria petrolífera, hasta países como Venezuela y México son muy afectados. La inflación está consumiendo a estos países. . . .

APPENDIX B

TRANSLATED PASSAGE USED IN THIS STUDY

Total words in passage: 273

Total sentences: 19

Average words per sentence: 14

Inflation

One of the most serious problems of Latin American countries is inflation. Of course, in the United States inflation is also a problem, but it is not as high as in some of the Spanish countries. Compared to the U.S. where inflation is 2–3%, a country such as Chile has a rate of 30% and inflation in Argentina is now 200%.

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How does inflation affect the population? Inflation affects everyone, especially the working class. Their salaries are often not sufficient to cover basic needs. It is a vicious circle because each time salaries are raised, prices go up as well. When prices go up, it is necessary to raise salaries again. Thus, inflation is always high.

In such an economic situation, it is nearly impossible to deposit money in the bank, first because people must pay more in order to survive and so do not have money to deposit in the bank; and second, because it is not a good idea to save anything under these circumstances. People think that instead of saving money, it is better to invest it in things that do not become devalued. Therefore, people with money invest it in land and other things which maintain a constant value. And if they do not have a lot of money, they buy television sets, clothes or electric appliances because they know that in a little while, prices of these items will be even higher.

The economic future of Latin America with respect to inflation is not known. Because of problems in the oil industry, even countries such as Venezuela and Mexico are greatly affected. Inflation is consuming these countries. . . .

APPENDIX C

WARM-UP PASSAGE

Total words in passage: 137

Total sentences: 12

Average words per sentence: 11

Silence

Have you observed the ways people from different cultures use silence? Have you noticed that some people interrupt conversations more than other people? All cultures do not have the same rules governing silence and communication. Many Americans interpret silence in conversations to mean disapproval, disagreement, or unsuccessful communication. They often try to fill silence by saying something even if they have nothing to say! On the other hand, Americans don't appreciate a person who dominates a conversation. Knowing when to take turns in a conversation in another language can sometimes cause difficulty. Should you wait until there is a long silence before contributing to a discussion, or can you break into the middle of someone's sentence? Interrupting someone who is speaking is considered rude in the United States. Even children are taught explicitly not to interrupt.

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APPENDIX D

IDEA UNIT DIVISIONS FOR PASSAGE: INFLATION (BASED ON CARRELL, 1985; VANPATTEN, 1990)

1. One of the most serious problems of Latin American countries is inflation.
2. Of course, in the United States (also)
3. inflation is a problem,
4. but it is not as high
5. as in some of the Spanish countries.
6. Compared to the U.S. where inflation is 2–3%,
7. a country such as Chile has a rate of 30%
8. and inflation in Argentina is now 200%.
9. How does inflation affect the population?
10. Inflation affects everyone,
11. especially the working class.
12. Their salaries are often not sufficient
13. to cover basic needs.
14. It is a vicious circle
15. because each time salaries are raised,
16. prices go up as well.
17. When prices go up,
18. it is necessary
19. to raise salaries again.
20. Thus, inflation is always high.
21. In such an economic situation,
22. it is nearly impossible
23. to deposit money in the bank,
24. first because people must pay more
25. in order to survive
26. and so do not have money
27. to deposit in the bank;
28. and second, because it is not a good idea
29. to save anything under these circumstances.
30. People think
31. that instead of saving money,
32. it is better
33. to invest it in things
34. that do not become devalued.
35. Therefore, people . . . invest it
36. with money
37. in land
38. and other things
39. which maintain a constant value.
40. And if they do not have a lot of money,
41. they buy television sets,
42. clothes
43. or electric appliances
44. because they know
45. that in a little while,
46. prices of these items will be even higher.
47. The economic future of Latin America . . . is not known.
48. with respect to inflation
49. Because of problems in the oil industry,
50. even countries such as Venezuela
51. and Mexico are greatly affected.
52. Inflation is consuming these countries. . . .

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APPENDIX E

SAMPLE SCORING OF WRITTEN PROTOCOLS

The following examples were scored as idea units in the present study:

1. Il est dit que l'inflation dans les pays latinos est très elevé (1)*
   "It's been said that inflation in Latin countries is very high"
2. C'est un problème ici (2)
   "It's a problem here"
3. mais c'est encore pire dans certains pays d'Amérique du sud ou l'inflation (5)
   "but it's even worse in certain countries in South America where inflation"
4. atteint de haut niveau (4)
   "reaches high levels"
5. On monte les salaires (15)
   "One raises salaries"
6. ce qui amène un hausse des prix (16)
   "which leads to higher prices"
7. et on recommence ce qui cree in cercle vicieux (14)
   "and we begin again creating a vicious circle"
8. Aussi les gens ne font pas d'économie dans les banques (23)
   "also people don't save money in the bank"
9. car ils savent (44)
   "because they know"
10. que leurs argent vaudra moins (46)
    "that their money will be worth less"
11. bientôt (45)
    "soon"
12. Alors ils achetent des biens (33)
    "So they buy goods"

The following examples were not scored as idea units in the present study:

1. La vie dans ces pays latino est très difficile et la pauvreté est très présente (similar to 1)
   "Life in these Latin countries is very difficult and poverty is very pronounced"
2. Mais ici les problèmes sont moins pire que ailleurs où certains pays font faillite (similar to 2, 3)
   "But here the problems are not as bad as other places where certain countries go bankrupt"
3. L'inflation engendre plusieurs problèmes (similar to 5, 6, 7, 8)
   "Inflation encompasses several problems"

*Numbers in parentheses refer to idea units in Appendix D.

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