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Sentence Processing in Spanish as a Second Language: a Study of Word Order and Background Knowledge

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Assigning subject or agent role to the first noun of an utterance appears to be a default or universal strategy for second language learners. Language learners tend to assign agent or subject role to the first noun of an utterance even when morphological cues indicate a conflicting interpretation. Lexical semantics – a learner’s underlying knowledge of the possible agents or experiencers of a given action – can override or attenuate a word order strategy. Except for studies involving lexical semantics, sentence processing research has focused primarily on surface features, such as morphology and syntax. The role of other knowledge sources, such as background knowledge, has not been investigated.

In contrast with sentence processing research, second language reading research has explored the role of background knowledge extensively. Background knowledge – defined here as topic or content knowledge – can enhance the comprehension of written discourse. The present study investigates whether background knowledge, like lexical semantics, can override or attenuate the tendency of learners of Spanish to assign subject role to the first noun of sentences presented orally.

1. Review of the literature

The Competition Model, proposed by Bates et al. (1984) and expanded by Bates and MacWhinney (1989), is the point of departure for the review of sentence processing research which motivates the present study. Discussion of the research on background knowledge is based on second language reading research.

1.1. The Competition Model

The Competition Model examines the relative strength of various linguistic features for the assignment of grammatical role in sentence processing. According to the Competition Model, cue validity, the informational value of a given cue, is the single most important determinant of the language learner’s attentional focus. Cue cost, the cognitive demand associated with a given cue, limits the learner’s ability to use that cue.

Cue validity is measured in terms of availability, reliability, and conflict validity. Availability is the frequency with which a given cue is present in the input. For example, Spanish has a much richer system of verb inflection than English. In the present tense, Spanish marks the verb form with six distinct inflections. English, in contrast, generally marks all forms alike except the third person singular. Verb morphology therefore has higher cue availability in Spanish than in English. In (1) below, for example, verb morphology is available as a cue to grammatical role in Spanish, but not in English.

(1) ø me ven
    SUB-ø OBJ-1st sing see-3rd pl
    'they see me'

Reliability is the frequency with which attention to a given type of cue leads to a correct interpretation. Basic word order in English, for example, is SVO. Because English word order is fairly rigid, word order is a highly reliable cue for grammatical role assignment in English. OVS constructions such as (1) are common in Spanish, so word order is a less reliable cue in Spanish. Although a first-noun strategy would lead to a correct interpretation of example (1) in English, it would lead to a misinterpretation in Spanish.

Conflict validity is the relative strength of a given cue in conflict with another cue. For example, speakers of Italian tend to assign agent or subject role based on lexical semantics when cues are in conflict (Bates et al 1984, MacWhinney et al 1984). In (2) below, lexical semantics and word order are in conflict. A learner relying on word order, would identify the first noun, il libro, as the subject. A learner relying on lexical semantics would identify Gianni, the second noun, as the subject. Thus, lexical semantics can override attenuate a first-noun strategy.

(2) ha letto il libro Gianni
    AUX-3rd sing read-past DET book Gianni

The assignment of semantic and grammatical role is of interest to first and second language researchers because it provides information about the relative strength of various linguistic features used in sentence processing. Syntactic, lexical-sematic, morphological, and prosodic cues are systematically varied and sentence interpretation is measured so that researchers can make inferences about the way these cues compete for learner attention. Although the Competition Model is predicated by child language acquisition research in sentence processing, it provides a theoretical framework for sentence processing research. The findings of second language sentence processing research are summarized in the next section.
1.2. Second language sentence processing research

Sentence processing research has examined the way first and second language learners assign semantic (agent/patient) and grammatical (subject/object) roles. This research has examined the relative strength of syntactic, lexical semantic, morphological, and prosodic cues in competition with one another. Second language research on sentence processing has demonstrated a strong tendency for learners to assign the role of subject to the first noun of an utterance even when surface features indicate that the second noun is the subject (Binkowski 1992, Gass 1989, Gilsan 1985, Lee 1987, LoCoco 1987, VanPatten 1984). These learners tend to interpret noun-verb-noun (NVN) constructions in the second language as subject-verb-object (SVO).

Although this first-noun strategy is highly reliable in English, it is less reliable in languages such as Spanish where object-verb-subject (OVS) constructions occur frequently. Studies of English speakers learning Spanish have found that these learners tend to mistake preverbal (clitic) object pronouns as subjects (Lee 1987, VanPatten 1984). For example, a second language learner of Spanish would tend to interpret the OVS construction (3) below, as 'they see the girl,' mistaking the preverbal object pronoun los as the subject.

(3) los      ve       la niña
OBJ-m. pl. see-3rd sing. the girl
'the girl sees them'

In (3), grammatical surface features and word order are in conflict. Although a word order strategy favors the first noun, grammatical surface features indicate that the second noun is the subject. The pronoun los indicates that the first noun is the object. The third person plural verb inflection agrees with the second noun, la niña, the subject of the sentence. Thus, a first-noun strategy would lead to a misinterpretation ('they see the girl'), whereas attention to grammatical surface features, in this case the third person plural verb inflection, would lead to a correct interpretation ('the girl sees them').

Assigning subject or agent role to the first noun of an utterance appears to be a default or universal strategy for second language learners (VanPatten 1984). When cues are in conflict, however, certain language-specific strategies appear to emerge. For example, when word order and lexical semantics are in conflict—as mentioned before—speakers of Italian tend to assign subject role based on lexical semantics rather than using a word order strategy. Thus, lexical semantics can override or attenuate a word order strategy.

Second language research has not investigated the role of background knowledge in sentence processing. Given that lexical semantics, a type of prior knowledge that operates at the word level, can override or attenuate a first-noun strategy, it is reasonable to predict that background knowledge might have a similar effect. To review the relevant literature on background knowledge, it is necessary to examine second language reading research.
1.3. Second language reading research

Although the present study investigates oral sentence processing, extensive attention has been given to background knowledge in second language reading research. Anderson and Pearson (1984) define reading comprehension as the integration of incoming information with information already stored in memory. Incoming information either fits with existing schemata (cognitive frameworks) or existing schemata are modified to accommodate the new information (Anderson and Pichert 1978, Rumelhart and Ortony 1977). More simply stated, the text serves as a “blueprint for meaning” (McNeil 1984).

Second language reading research support the position that background knowledge facilitates comprehension (Bernhardt 1991, Lee 1986, 1990, Koh 1985, Levine and Haus 1985, Steffensen, Joag-Dev, and Anderson 1979). Koh (1986), for example, found that recall of a text on a familiar topic was greater when learners were provided with a title and picture page. Recall was decreased, however, by providing a title and picture page for a text on an unfamiliar topic. Thus it would appear that background knowledge, or topic familiarity, is a key predictor of successful reading.

Background knowledge enhances language recognition, concept recall, and inferential reasoning (Swaffar 1988). Readers use prior knowledge to help construct meaning from a text (Bernhardt 1986, 1991, Lee 1990). Given the importance of background knowledge for comprehending written discourse, it is reasonable to expect a similar relationship to oral sentence processing.

2. The present study

In an OVS construction, reliance on the first-noun strategy would result in a misinterpretation. In the present study, the effects of background knowledge were explored by means of an experiment in which learners listened to and interpreted OVS constructions with and without the benefit of background knowledge. Background knowledge was operationalized as knowledge of Destinos: An Introduction to Spanish (VanPatten, Marks, and Teschner 1992), a content-based instructional video series in Spanish.

OVS constructions based on familiar characters and situations from the series were developed as stimulus sentences. Equivalent constructions were derived from these stimulus sentences and invented names were substituted for the names of the familiar characters. Stimulus sentences based on the familiar characters and situations represented the “Background Knowledge” condition. Sentences with invented names were designated “No Background Knowledge” sentences. The full list of stimulus sentences used in this study is available at http://www.cascadilla.com/supp/sath.html on the web.

Subjects listened to and interpreted both types of sentences, and their scores were compared to see whether background knowledge would result in more correct interpretations. Based on the current literature, it was hypothesized that subjects would more accurately interpret OVS constructions based on familiar characters and situations than those that were not.

3. Research Methods
3.1. Subjects

A total of 28 subjects participated. Students enrolled in Spanish 123 at the University of Illinois at Urbana-Champaign and Spanish 124, upper-division, first-year language courses, were chosen so that students would have knowledge of the characters and situations.

Spanish 124 is the last of a four-course sequence designed for students who wish to acquire a communicative language teaching approach to input and negotiation of meaning in instruction. The instructional material is from the textbook Introduction to Spanish: Student (VanPatten, Marks, and Teschner 1992), and Composiciones (Lee, Binkowski, 1991).

Entire classes were used in this study when volunteers were used. Participants’ educational and language background was assessed before testing began. Only students were used. Data from participants’ educational and language background.

3.2. Experimental Tasks

A Sentence Interpretation Task required learners to fill in a blank with the words that best fit the interpretation of the sentence. The blank space was on either side of the sentence.

In addition to the Sentence Interpretaion Task, subjects also completed a memory task. Subjects were asked to recall the name of each character and situation from the data pool. The Sentences Interpretation Task was available at http://www.cascadilla.com/supp/sath.html.

The stimulus sentences for the Sentence Interpretation Task. The task required learners to fill in the blank space with the words that best fit the interpretation of the sentence. The blank space was on either side of the sentence.
3. Research Methods

3.1. Subjects

A total of 28 subjects participated in the present study. These subjects were students enrolled in Spanish 124, a fourth-semester Spanish course at the University of Illinois at Urbana-Champaign. Only two courses at the university, Spanish 123 and Spanish 124, use the Destinos curriculum. These are a third-semester and fourth-semester course respectively. The fourth semester course was chosen so that students would have the necessary background knowledge: knowledge of the characters and situations from the first half of the video series.

Spanish 124 is the last of a four-course basic language sequence in Spanish, designed for students who wish to fulfill a graduation requirement which mandates four semesters of foreign language instruction. This course meets four days per week for 50 minutes each day. Instruction is based on principles of communicative language teaching, which emphasizes the role of comprehensible input and negotiation of meaning in the classroom. All participants had been instructed in the use and placement of direct object pronouns in previous semesters. The instructional materials for Spanish 124 are Destinos: An Introduction to Spanish: Student Viewer's Handbook, Workbook/Study Guide (VanPatten, Marks, and Teschner 1992) and Ideas: Estrategias, Lecturas y Composiciones (Lee, Binkowski, and VanPatten 1994).

Entire classes were used in order to avoid problems in self-selection that can occur when volunteers are used. In order to control for certain aspects of the participants' educational and language background, a questionnaire was given to them before testing began. Only data from participants whose first language is English were used. Data from participants who did not take Spanish 123, the course in which the first half of the video series is presented, were not used. After data from ineligible participants were eliminated, data from 28 subjects were analyzed.

3.2. Experimental Tasks

A Sentence Interpretation Task provided the data for the present study. This task required learners to fill in missing names on an answer sheet to indicate their interpretation of the sentences they heard. The verbs were provided in English with a blank space on either side for the names to be filled in.

In addition to the Sentence Interpretation Task, a Matching Task was administered to ensure that all participants were equally familiar with the characters and situations from the video series. This task required learners to match the names of the series characters to descriptions of those characters. Subjects who answered any of the items on this task incorrectly were eliminated from the data pool. The Sentence Interpretation Task and Matching Task are available at http://www.cascadilla.com/supp/sath2.html on the web.

The stimulus sentences for the Sentence Interpretation Task consisted of ten target sentences for each sentence type — that is, ten Background Knowledge target sentences and ten No Background Knowledge sentences — plus a total of
forty distractors and two practice sentences. Twenty distractors were based on Destinos characters and twenty were not. Distractor sentences were varied in length and complexity. One practice sentence was based on Destinos characters and the other was not.

Target sentences were OVS constructions with one male and one female Noun Phrase (NP) in each. These sentences were designed with mixed-gender pairs of NPs so that the gender-marked direct object pronoun would be available as cues to grammatical role. Practice sentences were SVO constructions whereas distractors were alternate word order constructions derived from the target sentences.

Many verbs, such as buscar 'to look for' and ayudar 'to help,' represented common events in the video series. These verbs were repeated in combination with various names in both the No Background Knowledge and the Background Knowledge stimulus sentences. Thus, the subjects could not merely fill in the blanks without attending to the stimulus sentences.

The stimulus sentences for the Background Knowledge and No Background Knowledge conditions are illustrated in (4) and (5) below respectively. The Background Knowledge sentences are based on the Destinos series, while the No Background Knowledge sentences are derived from the Background Knowledge sentences.

(4) Background Knowledge
   A Raquel la contrata don Pedro.
   OBJ Raquel OBJ-f hires don Pedro
   'Don Pedro hires Raquel.'

(5) No Background Knowledge
   A Silvia la contrata Ricardo.
   OBJ Silvia OBJ-f hires Ricardo
   'Ricardo hires Sylvia.'

3.3. Materials

Materials packets consisted of a consent form, a background information questionnaire, a vocabulary sheet, and answer sheets for the Matching Task and the Sentence Interpretation Task. The questionnaire was for screening subjects. The purpose of the vocabulary sheet was to control for lexical knowledge. Subjects were given two minutes to study critical vocabulary from the task before beginning the experimental tasks.

Audiotapes for the Sentence Interpretation Task were recorded in the language laboratory of the University of Illinois at Urbana-Champaign. A native speaker read the sentences with a ten second pause between items. Each sentence was preceded by its item number in sequence – spoken in English.

Stimulus sentences were presented according to a split-block design in order to prevent any effects for order of presentation. Sentences were divided into 3 blocks of 20 sentences designated "A," "B," and "C." The order (e.g. BCA, and CAB) were of sentences.

3.4. Data collection

The testing was carried out during their regular class hour. Eight subjects were participating in a block.

Testing packets were given to each participant and they were instructed to study the text until all participants had completed two minutes to study the text. Subjects were instructed to begin the Sentence Interpretation Task after two minutes. A picture described each block of sentences.

3.5. Scoring and analysis

For each sentence, subjects were asked to score each sentence for a total of 12 sentence (correctly and incorrectly). A total score was calculated for each subject. The mean scores were calculated for each subject. The mean scores were then grouped into three categories: 1) correct, 2) partially correct, and 3) incorrect. The results are shown in Table 1 and 2.
blocks of 20 sentences each, not including practice sentences. The blocks were designated “A,” “B,” and “C” and three different presentation orders (ABC, BCA, and CAB) were used. Practice sentences always preceded the first block of sentences.

3.4. Data collection

The testing was carried out in the participants’ regular classrooms, during their regular class hours. The researcher was present in each testing environment to administer the materials and explain the task. Students were told that they were participating in a study of listening comprehension in Spanish.

Testing packets were distributed and the participants were instructed to sign the consent forms and complete the background information sheets and then to wait until all participants were ready to begin the experiment. When all participants had completed the background information sheets, they were given two minutes to study the vocabulary sheets. At the end of two minutes, the participants were instructed to turn to their answer sheets. When they were ready to begin the Sentence Interpretation Task, the audio cassette was played with pauses between blocks of sentences in order to allow participants to turn the pages. A picture description task was administered as a distractor task between blocks of sentences.

3.5. Scoring and analysis

For each sentence type on the Sentence Interpretation Task (No Background Knowledge and Background Knowledge) there were ten target sentences. Each of these sentences received a score of 1 when the sentence was interpreted correctly. A total score of zero indicates that a participant never gave a correct interpretation for that sentence type, and a total score of 10 indicates that the participant always gave a correct interpretation. Data were submitted to a repeated measures analysis of variance with score as the dependent variable, and Sentence Type as the independent variable. Alpha was set at .05 for this analysis. The results are described in the following section.

4. Results

The analysis of variance revealed a significant main effect for Sentence Type ($F=4.096, p=.0479$). An examination of the mean scores for Sentence Type reveals that sentence interpretation was about 20% more accurate when Background Knowledge was available as a cue to grammatical role than when it was not. Mean scores indicate that Background knowledge sentences were correctly interpreted about 72% of the time. However, even without background knowledge, learners—on the average—were able to correctly interpret sentences about 52% of the time. The means and ANOVA summaries are presented in Tables 1 and 2, respectively.
Table 1.
Mean scores for sentence type

<table>
<thead>
<tr>
<th>Sentence Type</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background Knowledge</td>
<td>7.179</td>
<td>3.400</td>
<td>.643</td>
</tr>
<tr>
<td>No Background Knowledge</td>
<td>5.179</td>
<td>3.973</td>
<td>.751</td>
</tr>
</tbody>
</table>

n=28
Highest possible score=10
Possible range of scores=0-10

Table 2.
ANOVA summary for sentence type

<table>
<thead>
<tr>
<th>Contrast</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sentence Type</td>
<td>2</td>
<td>56.000</td>
<td>56.000</td>
<td>4.096</td>
<td>.0479</td>
</tr>
<tr>
<td>Residual</td>
<td>54</td>
<td>738.214</td>
<td>13.671</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The objective of the split-block design was to reduce the chance of a learning effect. In order to determine whether a learning effect was present, a presentation order analysis was performed. Frequencies of correct responses on the first and last target sentences of each type were calculated and a Chi-square analysis was performed.

A Chi-Square analysis of the first and last No Background Knowledge and Background Knowledge target sentences revealed a significant main effect for Presentation Order for both sentence types (p=.0001). An examination of the Chi-Square tables indicates that frequency of correct responses on the last target sentence of both types was significantly higher than the frequency of correct responses on the first. The Chi-Square analysis is presented in Tables 3 and 4.

Table 3.
Chi-Square table for presentation order analysis on background knowledge target sentences

<table>
<thead>
<tr>
<th>Correct Responses</th>
<th>First Sentence</th>
<th>Last Sentence</th>
<th>n</th>
<th>df</th>
<th>Chi-Square</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19</td>
<td>22</td>
<td>28</td>
<td>1</td>
<td>35.234</td>
<td>.0001</td>
</tr>
</tbody>
</table>

5. Discussion

The results of the experiment show that background knowledge can override the effects of sentence type. In subjects who would more likely be readers, sentences were based on, was supported, not supported. The language reading reapplication of background knowledge was not an issue.

According to previous studies, the present study did not correctly identify the average without the aid of sentence type. The high mean scores for Background Knowledge subjects were fourth-grade learners. In the use of previous instruction, it was observed as well. These learners were predisposed to demonstrate the ability that only one level of background knowledge can be transferred.

6. Implications and Applications

The limitations of the current study are: first, it is not representative of learners at a lower level of proficiency; second, it should not have received the full attention of the learners. Future research would benefit from a more detailed specification of the context in which the learning environment occurs, particularly the need for learners to receive training in the use of background knowledge.
Table 4.
Chi-Square table for presentation order analysis on no background knowledge target sentences

<table>
<thead>
<tr>
<th>Correct Responses</th>
<th>First Sentence</th>
<th>Last Sentence</th>
<th>n</th>
<th>df</th>
<th>Chi-Square</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
<td>17</td>
<td>28</td>
<td>1</td>
<td>20.346</td>
<td>.0001</td>
</tr>
</tbody>
</table>

5. Discussion

The results of the present study provide evidence that background knowledge can override or attenuate the first-noun strategy. The hypothesis, that subjects would more correctly interpret OVS stimulus sentences when the sentences were based on familiar characters and situations than when they were not, was supported. This finding is consistent with findings from second language reading research which have demonstrated that the appropriate application of background knowledge can enhance comprehension of written discourse.

According to previous research, English speakers learning other languages tend to rely on word order for grammatical and semantic role assignment. The results of the present study did not corroborate these earlier findings. Although Background Knowledge did appear to enhance comprehension, the learners in the present study did not demonstrate a tendency to rely on word order. They correctly identified the second noun as the subject about 52% of the time on average without the aid of background knowledge.

The high mean scores on both sentence types may be due to the fact that the subjects were fourth-semester students who had been instructed in previous semesters in the use and placement of direct object pronouns. Learner level and previous instruction may have accounted for the presentation order effects observed as well. These learners, due to level and previous instruction, may have been predisposed to detect sentence patterns. A limitation of the present study is that only one level of learners was included, and that these were not beginning learners.

6. Implications and Conclusion

The limitations of the present study indicate the need to replicate the study with learners at a lower proficiency level as subjects. Ideally, these learners should not have received previous instruction in direct object pronouns. This specification will limit the content of the stimulus questions to actions which occur earlier in the video series.
The results of the present study support the idea that background knowledge plays a role in the processing of second language sentences. In order for learners to acquire forms, however, they must associate form with meaning (Terrell 1986, VanPatten 1985). Thus acquisition depends not only on comprehension, but on attention to surface features as well. Future research is needed to investigate the role of background knowledge in the acquisition of grammatical (surface) features.

Learners process input for meaning before processing it for form (VanPatten 1989, 1990). In order for learners to process input for form, they must be able to process for meaning at little or no cost to attentional capacity. By reducing the cognitive burden of comprehension, background knowledge may serve to make attentional capacity available for attention to form. Thus, if background knowledge serves to make input comprehensible, it should also serve to make input available for acquisition. This question remains to be explored.

The present study and related subsequent research has potentially important pedagogical implications with respect to the use of content-based curricula. The present study supports the idea that background knowledge – operationalized here as knowledge of a content-based video series – has beneficial effects for the comprehension of second language utterances. The role of background knowledge in the acquisition of second language surface features, such as morphology, remains to be explored.

Notes

* I would like to thank Bill VanPatten, James F. Lee, and Diane Musumeci for their advice and support throughout this project. All shortcomings, of course, remain my own.

References


Sentence Processing in Spanish as a Second Language


The Effects of Morphosyntactic Input on L2 Reading Comprehension and Input Focus

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The Input Hypothesis claims the following: to move from stage 1 [current communicative competence] is that the acquirer understands the message” (Krashen 1982: 21). The foremost of discussion was termed the debate over the role of comprehensible input. Our point is not to comment on the debate but to hypothesize clearly connects comprehensible input. Krashen’s theorizing originated in and continued a line of second language investigation comprehensible research. Research was undertaken to determine if the input would result in better comprehensible input, the more comprehensible the input was, the more.

Many who would criticize the Input Hypothesis say that they are insufficient for acquisition to the next stage of acquisition. Efficiency and have sought to propose what, if anything, would be sufficient for acquisition. One of input + interaction (Crookes and Gass 1983) and Pica 1992, among others) and of comprehensible search has recently led second language researchers to other relationship between comprehending the input. Using the forms of the input to build a link.

Long and Ross (1993) address the role of input language acquisition as follows. They argue that comprehension (i.e., linguistically simplify