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COMPREHENSIBLE INPUT AND SECOND LANGUAGE ACQUISITION

What Is the Relationship?

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This study attempts to test aspects of the input hypothesis (Krashen, 1980, 1983, 1985) and Long's modification of it (Long, 1980, 1983a, 1985). Specifically, it experimentally tests the hypothesis that both input and interactional modifications facilitate second language acquisition, using Japanese as the target language. Three experimental groups were differentiated in terms of input and interaction conditions: (1) unmodified input with no interaction, (2) premodified input with no interaction, and (3) unmodified input with the chance for negotiated interaction. The groups were compared in terms of (a) their degree of comprehension of the input and (b) their subsequent retention of vocabulary items and acquisition of two Japanese locative structures. The results indicated that moment-to-moment comprehension was highest for the negotiated interaction group, whereas there was no significant difference between the two noninteraction groups. Furthermore, there was no correlation found between differences in moment-to-moment comprehension and gains in vocabulary recognition and acquisition of structures, though significant gains on

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both measures were found for all three groups. Discussion of these findings centers on the relationship between comprehension and acquisition.

The question of the role of comprehension in second language acquisition (SLA) has been of prime importance in much SLA research and theory for the last decade. Two of the most influential SLA hypotheses concerned with this question are the input hypothesis (Krashen, 1980, 1983, 1985) and an important extension of it, the input and interaction hypothesis (Long, 1980, 1983a, 1985; Pica, Young, & Doughty, 1987). To date, the connection between comprehension and SLA has been logically inferred through a combination of research findings from studies of various input types such as motherese (e.g., Snow & Ferguson, 1977), foreigner talk (e.g., Long, 1980), teacher talk (Chaudron, 1988), and premodified input (e.g., Parker & Chaudron, 1987; Ross, Long, & Yano, 1991), and studies of negotiated interaction (e.g., Long, 1980, 1983a; Pica et al., 1987) or the lack of it (Sachs, Bard, & Johnson, 1981). Nevertheless, to the knowledge of this author, a direct causal relationship between comprehension and SLA has yet to be empirically established through experimental research (see also Gass & Varonis, 1994; Long, 1985; Pica, 1992).

The Input and Interaction Hypothesis

The input and interaction hypothesis (Long, 1980, 1983a, 1985) combines an argument regarding the importance of input comprehension to SLA (Krashen's input hypothesis: 1980, 1983, 1985) and an argument for the value of modifications to discourse structure for learner comprehension (Long's interaction hypothesis). Thus, Long deductively argues that modifications to discourse structure (e.g., negotiated interaction and modified input) indirectly facilitate SLA. Krashen's input hypothesis (1985) states that second language (L2) input must both be comprehended and be at one stage above the learner's current level ($i + 1$) in order to be acquired. An added stipulation is that the learner be emotionally receptive to the input, or, in Krashen's terms, the affective filter must be low. Thus, comprehensible input is held to be a necessary, though not sufficient, condition for SLA (Krashen, 1985; Long, 1983a).

Comprehension and Acquisition. The process of turning input into intake has been described by Krashen (1983, pp. 138–139) as follows: First, learners understand a message using the not yet acquired $i + 1$ L2 structure and somehow connect the form with its meaning. Second, learners must notice a difference between their current interlanguage (IL) competence and the L2 form. If the form then shows up again with enough frequency, it may be acquired. Chaudron (1985) has pointed out that this formulation still lacks a sufficiently detailed psycholinguistic account of the perceptual mechanisms involved in noticing a gap or what constitutes $i + 1$. Chaudron also has noted that since the linguistic scope of this hypothesis has been left unclear by Krashen, we may assume that it refers to all levels of L2 forms (i.e., from syntactic to lexical). Furthermore, it has been argued (Schmidt, 1990; Schmidt &

Frota, 1986) that one needs to consciously notice, that is, attend to, such gaps in one's IL in order for acquisition to occur. This claim, while appealing, also awaits rigorous testing.

Direct evidence for the necessity of comprehension to acquisition would be provided by learners who, though exposed to large doses of L2 input, were unable to comprehend it and showed no evidence of acquisition. Good examples of this come from children whose only input, though frequent, is provided by television. Anecdotal evidence of such a case comes from Dutch children for whom TV provides their only exposure to L2 German (Snow et al., 1976). Stronger evidence is provided by Jim, the hearing child of deaf parents, for whom daily TV watching was his only source of English input (Sachs et al., 1981). This evidence seems to suggest that TV input, presumably unmodified and generally incomprehensible, is insufficient for much acquisition to occur.

Evidence against a one-to-one linear relationship between L2 comprehension and the acquisition of L2 syntax comes from a recent study of adult learners (Doughty, 1991).[1] In this study differences in reading comprehension between learners in two treatment groups were not matched by differences in acquisition. Comprehension was measured by test questions and written first language (L1) recall protocols completed immediately after the treatment; acquisition was measured by pretest/posttest gains in verbal production of relative clauses. One group, focused on meaning, showed greater comprehension than the other group, focused on form. Yet both groups showed equally significant pretest/posttest gains. From the viewpoint of the input hypothesis, the question is why the group evidencing less input comprehension acquired as much as the group evidencing more. A possible explanation is that there is an, as yet, undetermined minimal level of comprehension below which acquisition is impossible, but above which differences in comprehension have little effect on SLA.

The input hypothesis has also been criticized on other grounds (reviewed in Young, 1988). Two proposed revisions to the input hypothesis relevant to this discussion are the incomprehensible input hypothesis (White, 1987) and the comprehensible output hypothesis (Swain, 1985). Both suggest that negative feedback, during either comprehension or production, is vital to IL development. White (1987) has argued that, besides comprehensible input, incomprehensible input is also vital to SLA. Briefly, White has argued that when learners encounter input that is incomprehensible because their IL rules do not permit a particular L2 structure, they may be pushed to modify those IL rules to accommodate the structure. Thus, comprehension difficulties can provide important negative feedback to the learner (cf. Faerch & Kasper, 1983). Swain (1985) and Pica, Holliday, Lewis, and Morgenthaler (1989) have argued that, in addition to comprehensible input, comprehensible output is also necessary for SLA. This argument hinges on the fact that learner production sometimes elicits either direct or indirect negative feedback from an interlocutor. If communicative demands are put on the learners to make their output more comprehensible, in the process, they may test and modify their IL hypotheses.

Adjustments and Comprehension. The crux of Long's (1980) argument for the adjustments-to-comprehension relationship is the question of how input is made

comprehensible to the learner. One way is to modify the interactional structure of discourse through negotiated interaction between speaker and listener. Much of the research on negotiated interaction (Doughty & Pica, 1986; Gass & Varonis, 1985; Long & Sato, 1983; Loschky, 1988; Pica & Doughty, 1985; Pica et al., 1987; for review, Pica, 1992) has concentrated on a subset of strategies and tactics (Long, 1983b) used in conversation to overcome comprehension difficulties (see Shimura, 1989, for Japanese as a second language; Varonis & Gass, 1985, for a different discourse model). The three best known strategies and tactics are the *clarification request*, the *confirmation check*, and the *comprehension check*. For the purpose of aiding comprehension, the former two are used by the listener and the latter is used by the speaker.

To this author's knowledge, the only published study to test the effect of negotiated interaction on comprehension is by Pica et al. (1987). In that study a listening task was administered to two groups of nonnative speakers (NNSs): in one group the NNSs negotiated interaction with their native-speaker (NS) interlocutors; in the other group, NNSs could only listen. NNSs in the interaction condition scored significantly higher on the listening task, thus supporting the claim that adjustments in the form of negotiated interaction facilitate comprehension.

Another way to increase learner comprehension is for the speaker/writer to modify the input (e.g., lexis, morphology, syntax) directed at the listener/reader. Input modifications are frequently the linguistic byproduct of negotiated interactions (Pica et al., 1987) and may be classified as either input simplifications or elaborations (Parker & Chaudron, 1987; Ross et al., 1991). Thus, if a listener asks for clarification of a previous utterance, the speaker will frequently respond by elaborating on the utterance (e.g., by repeating, rephrasing, or explaining it), or by simplifying it (e.g., by using less complex grammatical structures or higher frequency lexical items). (See Long, 1980, 1983a; Parker & Chaudron, 1987; Ross et al., 1991, for reviews.)

Evidence for the facilitation of comprehension by input modification was reviewed by Parker and Chaudron (1987). The authors analyzed 12 studies comparing NNS comprehension (for both listening and reading) of unmodified and premodified input (i.e., scripted input modified by the researchers). Overall, premodified input increased NNS comprehension. Furthermore, the authors concluded that input elaborations facilitate comprehension at least as much, if not more than, input simplifications, which, they argued, may be unnecessary for optimum comprehension. A similar argument has been made by Pica et al. (1987), who used premodified input in their noninteraction group. When the authors compared their premodified input with the input modifications produced during negotiated interactions, they argued that "a decrease in the complexity of the input did not appear to be a critical factor in comprehension. Indeed, . . . interaction resulted in input that was *more complex* [italics added] than input that was modified according to conventional criteria of linguistic simplification" (pp. 749–750), yet this input led to greater comprehension.

The studies cited above provide mixed support for a comprehension-to-acquisition relationship and stronger support for an adjustments-to-comprehension relationship. Within the category of adjustments, there seems to be an advantage for negotiated interaction over premodified input. However, as Long (1983a) has

previously noted, there is still a clear "need for direct tests" (p. 191) of the adjustments-to-acquisition hypothesis. The present study attempts to do just that. It differs from previous research by tracing the path from L2 forms contained in input, with or without premodifications or negotiated interaction, through the process of comprehension, to measures of intake or acquisition.

Research Questions and Hypotheses

Several research questions motivated this study. First, because of the need for replication of the preceding findings regarding the adjustments-to-comprehension relationship, the following questions were of interest:

1. Does negotiated interaction facilitate L2 comprehension relative to noninteraction (including premodified input)?
2. Does premodified input facilitate comprehension relative to unmodified input and unmodified interaction (i.e., noninteraction)?

Finally, and most importantly:

3. Does greater L2 comprehension lead to greater L2 acquisition?

The theoretical argumentation put forward by Long (e.g., 1983a) and the evidence provided by Pica et al. (1987) motivated the first research hypothesis:

> Hypothesis 1. Negotiated interaction facilitates learner comprehension relative to noninteraction.

Findings such as those cited in Parker and Chaudron (1987) and Ross et al. (1991) formed the basis for the second research hypothesis:

> Hypothesis 2. Premodification of input facilitates comprehension relative to nonmodification of input and interaction.

As stated earlier, the research to date does not provide us with a clear answer as to the quantitative relationship between rates of comprehension and acquisition. Nevertheless, to predict anything other than a positive relationship between these two variables would seem incongruent with Krashen's input hypothesis (1985). Thus, the final research hypothesis stated the following:

> Hypothesis 3. Greater L2 comprehension leads to greater L2 acquisition.

Alpha was set at .05 for all statistical tests.

METHOD

To investigate the preceding questions, the present study tried to incorporate the following design features: (a) a method for studying the adjustments-to-comprehension relationship comparable to that used in previous studies, (b) a pre-

test/posttest design to measure learner intake, and (c) measures of short-term gains specific to the input to be comprehended. Additionally, it focused on beginning-level foreign language learners, English-speaking learners of Japanese in Hawaii, in order to minimize exposure to L2 input outside of the experiment.

To meet the need for sensitive measures of short-term gain, an approach similar to that argued for by Clark and Hecht (1983) in L1 acquisition research, was adopted: "Input studies to date . . . have focused almost entirely on what children produce, and not on what children understand. Yet input necessarily has its most immediate effects on comprehension rather than on production" (p. 345). Of course, this is exactly the argument underlying what Krashen (1985) has called the "silent period" in SLA (p. 9), and such an approach has more recently been called for by other SLA researchers (e.g., Hulstijn, 1989; Sharwood Smith, 1986). Thus, in this study, SLA was operationalized in terms of gains in (a) vocabulary recognition, generally considered the first stage in vocabulary acquisition (Teichroew, 1982), and (b) sentence verification, long used to measure receptive grammatical processing (Fraser, Bellugi, & Brown, 1963). Both are well-established measures of acquisition in psychology (Foss, 1988; Murdock, 1982; Slobin, 1989). In Chaudron's (1985) terms, both measures are "close to the input" (p. 9); they require no production and a limited degree of abstraction from the input in order to respond. Thus, a clear connection between comprehension and intake can be made if gains in vocabulary and syntax (contained in the input learners are exposed to during the experiment) are shown to covary with learners' moment-by-moment comprehension of those same forms during their respective treatments.

Subjects

The subjects were 41 beginning-level learners of Japanese as a Foreign Language (JFL) studying at the University of Hawaii at Manoa. Subjects were paid a nominal fee to take part in the study. The subjects were chosen from two different proficiency levels: the second and fourth semesters of Japanese study. This increased the probability that the input would be of value for acquisition to at least some of the learners (i.e., in Krashen's terms, at the $i + 1$ level) since, if only one level of students were used, there would be a greater risk of the input being either too difficult or too easy. One semester before the actual study, pilot testing of the syntax and vocabulary measures used in the study indicated the forms were neither too easy nor too difficult for learners at either of these levels, while, at the same time, there were clear differences between the two groups on both measures. Subjects were primarily native speakers of English (37) but also included two bilinguals, one Tagalog/English and one Cantonese/English, and two speakers dominant in other Chinese dialects.

Procedure

This study used an experimental design that included a pretest/posttest design, online listening comprehension tasks/measures during the treatments, and a baseline comparison group to control for acquisition effects inherent in the other treat-

ments. Subjects were assigned to three groups using a random block design controlling for level and L1, each performing listening tasks that differed in terms of input and interaction:[2]

1. Baseline input (BL) group (n = 14): − input premodification, − interaction
2. Premodified input (PM) group (n = 14): + input premodification, − interaction
3. Negotiated interaction (INT) group (n = 13): − input premodification, + interaction

After subjects were assigned to the above three groups, the groups were also compared in terms of the following subject variables: L1, age, gender, childhood L2 exposure, years of L2 instruction, time (if any) spent in the L2 culture (Japan), and L2 proficiency as measured by department placement tests of grammar, listening, reading, and knowledge of Chinese characters (*kanji*).[3] Chi-square analyses (for nominal scale variables) and ANOVA (for interval scale variables) showed no significant differences between groups at the .05 level.

The experiment took place over 5 consecutive days. Prior to beginning, both the learners and their NS tutors (all of whom were teachers) were told that the study dealt with listening comprehension and the use of gamelike communication tasks; tutors were told explicitly not to give grammar explanations, even if asked. On the 1st day, learners were given sentence verification and vocabulary pretests. Over the following 3 days, learners met individually with tutors for approximately 15–30 min per day and did listening tasks under the three input/interaction conditions. On the 5th day, learners were posttested with the same measures as used in the pretests.

Acquisition Targets

Vocabulary Items. Japanese vocabulary items chosen as acquisition targets in the experiment were 34 concrete nouns. The two chief criteria for selecting the target vocabulary items were the following: (a) the items were most likely unknown to the learners (as judged by their absence from course vocabulary lists and by checking with one instructor from each course level); (b) the items made sense as possible items within their respective tasks. The number of items seemed reasonable to acquire within a period of close to 1 hr (the approximate total time of the treatments) according to studies reported in Nation (1982).

Sentence Structures. Two Japanese double-noun locative sentence structures with postpositional particles were chosen as acquisition targets for the experiment:[4]

(1) *Koen no temae ni eki ga /wa arimasu.*
park GEN this side LOC station SUBJ/CONT exist
Locative/Ground Subject/Figure
"This side of the park is a station."

(2) *Eki ga /wa koen no temae ni arimasu.*
station SUBJ/TOP park GEN this side LOC exist
Subject/Figure Locative/Ground
"The station is this side of the park."

These sentence structures were chosen for three reasons. First, they are frequently semantically reversed by beginning learners of Japanese (Loschky, 1989; Y. Sasaki, personal communication, March, 1991). Structures of the type shown in sentence (1) (repeated below) are frequently misinterpreted in the following way ([ ] = parsed unit, ? = unknown role assignment):

(3) *Koen no temae ni eki ga arimasu.*
park *SUBJ *[this side *of station] ? exist
*"The park is this side of the station."

Locative sentence structures were also chosen because they have clear form–function relations (Herskovits, 1985) and can be visually represented in tasks and tests relatively easily.[5]

Full review of the possible reasons for learners' semantic reversals of such sentence structures would take us too far afield. Briefly, it is possible that L2 learners misinterpret Japanese locative/ground initial sentences because of transfer of L1 syntax (English is a head-initial language and Japanese is a head-final language; Hoji & Kitagawa, 1990), L1 semantics/pragmatics (English speakers tend to encode figures sentence initially and Japanese do so with grounds; Sridhar, 1989), or an interaction between the two (see Gass, 1989; MacWhinney & Bates, 1989, regarding interactions).[6] Such an explanation does not make similar predictions of difficulty in interpreting subject/figure initial sentences. Nevertheless, pretesting of measures used in the study showed that both types of sentences were subject to misinterpretation by beginning-level learners. Thus, for the limited purposes of this study, it is enough to say that the above-stated reversals in sentence interpretation occur frequently and in ways that may be explainable in terms of both syntactic structure and semantic/pragmatic roles, though such explanations need to be tested.

Materials

Pretest/Posttest Measures. The pre- and posttests consisted of two sections: vocabulary recognition and sentence verification. The vocabulary section, an aural yes/no measure of recognition memory for item information (Murdock, 1982), asked students whether they recognized each word heard on a tape of 128 randomly ordered items from four approximately equal sets of words: those *new* and *old* words that were used in the tasks (k = 34 and 30, respectively),[7] and those new and old words not used in the tasks (k = 32 each). The unused items served as distractors and as fillers to avoid priming the students. The pretest, which determined the degree to which old and new words were known and unknown by the learners, asked which words were recognized *at all.* Thus, each yes answer was given 1 point and each no answer none. The posttest, on the other hand, measured the accuracy with which students recognized the 34 new words *used in the tasks* during the treatment. Thus, correct answers, yes or no, were given 1 point and incorrect answers none.[8]

The sentence verification section contained 32 randomly ordered aurally pre-

sented sentences of which half were true and half were false encodings of eight pictures they described. Each sentence contained a Japanese locative postposition taken from the students' first-semester textbook; half of the sentences were locative initial and half were subject initial. Students looked at a picture, heard one of four possible sentence types, and circled either "true" or "false" on their answer sheets. To avoid priming, 28 filler items were added using two other structures from the students' first-semester textbook. Thus, while there were 60 total items, only the 32 locative items were included in the analysis.[9]

Treatment Tasks/Measures. Subjects performed three sets of listening tasks (36 items total) over the 3-day treatment period, one set of tasks (12 items) per day. The tasks served dual purposes as (a) online measures of comprehension of L2 input and (b) the acquisitional intervention. They were "information-gap" tasks (e.g., Rixon, 1979; see Pica, Kanagy, & Falodun, 1993, for a more detailed definition); that is, information flowed one way from the NS to the NNS, it was required to be exchanged, interactants had the same goal, and there was only one acceptable outcome. However, only in the interaction condition was there a possibility for a truly communicative interchange.

The three sets of tasks are referred to topically as (a) Still Lifes, (b) Maps, and (c) Shapes. Still Lifes showed arrangements of everyday objects, such as pens, rulers, or magnifying glasses in perspective. Maps showed bird's-eye views of streets bordered by various locations such as parks, shrines, or train stations. The Shapes tasks showed two-dimensional vertical and horizontal arrangements of black, white, or gray triangles, squares, rectangles, and circles.

The sets of tasks were done in the order of Still Lifes first, Maps second, and Shapes third, as pilot tests had shown that the Still Lifes tasks were the easiest and the Shapes tasks the most difficult. Within each of the three sets of tasks, the learners worked through six trials (each comprised of a different picture sheet), each of which contained a subset of two target objects.[10] The learners had to identify and number the target object described in each baseline input sentence (i.e., the subject of the sentence). The subjects also completed a training task and had time to ask procedural questions before beginning the task set for each day.[11]

Task Variables. Differences among the three groups in the study were manifested in the handling of input in the listening tasks.

The first group, the *baseline input* (BL) group, was used to control for the acquisition effects inherent in the premodified input and negotiated interaction treatments. The baseline input consisted of simple sentences constructed using the L2 vocabulary and structures to convey meaning in the tasks. Both learners and tutors in the BL group understood that for each task trial the tutors would read each of the baseline input sentences to the learners only once, at normal speed, and that no clarification or other negotiated interaction was allowed.

In the *premodified input* (PM) group, the NS tutors began by reading baseline input sentences to the learners, but following each sentence the tutors also read an extra sentence intended to clarify the first. The extra sentences were constructed by

NS informants in cooperation with the researcher. Premodifications consisted of elaborations or simplifications of the baseline; both types of modification included repetitions of the subject noun and the locative nominal. Below is an example of elaborative premodification. Sentence (5) served to clarify the baseline sentence in (4):

(4) (Baseline sentence)
Pen no migi ni monosashi ga arimasu.
pen GEN right LOC ruler SUBJ exist
"To the right of the pen is a ruler."
(5) (Additional sentence in the PM condition)
Sen o massugu kaku monosashi wa, pen no migi ni aru.
line OBJ *straight* draw ruler TOP, pen GEN right LOC exist
"The ruler that draws *straight* lines is to the right of the pen."

Here, the subject of the baseline sentence, the new vocabulary item *monosasi* ("ruler"), is moved to sentence-initial position and clues to its meaning are given. In the process, however, the second sentence is relativized, thus becoming syntactically more complex than the baseline. Sentences (6) and (7) below exemplify the process of simplification of the baseline:

(6) (Baseline sentence)
Ookii kuroi maru wa ookii kuroi shikaku no ue ni arimasu.
big black circle TOP big black square GEN above LOC exist
"A big black circle is above the big black square."
(7) (Additional sentence in PM condition)
Maru wa ue desu.
circle TOP above COP
"The circle is above."

In this case, the second sentence serves primarily to focus the learner on the subject noun and the locative nominal. It does so at the cost of losing some information, but it also becomes much shorter than the baseline input sentence in number of words.

Unlike the baseline condition, the PM group tutors were encouraged to modify their speed of delivery or stress patterns according to the student's apparent level of comprehension. As with the BL group, however, no negotiated interaction with the learners was allowed.

In the *negotiated interaction* (INT) group, NS tutors also read the baseline input sentences to the learners but were encouraged to add modified input spontaneously (e.g., repetitions, rephrasings, or explanations of the baseline sentences) or to negotiate interaction with the learners (e.g., by answering any meaning-oriented questions helpful in identifying the referents). Subjects in the INT group were encouraged to ask questions pertaining to the meaning of the sentences whenever they wished.

To test the effect of comprehension on acquisition more strictly and to protect the validity of the study, three control variables were uniformly shared by all groups. These were *time granted learners to finish tasks, knowledge of results/feedback,* and *exposure to new words.*

No limit could reasonably be put on the time spent on tasks in the various conditions for two reasons. First, an upper time limit would possibly restrict the amount of interaction that learners in the INT group could perform, thus limiting the full effects of interaction. Second, a lower time limit would probably irritate the learners in the BL and PM groups who might be forced to wait after they had already finished a task item. Therefore, all students were allowed to control the time taken by saying when they wanted to go on to the next task item. An objection that might be raised is that the INT group is likely to have more time on task than the other groups, thus confounding the variables of time on task and negotiated interaction. Such an objection is, however, untenable. Increased time is an inherent difference between negotiated and unnegotiated interaction (a lecture interrupted by questions necessarily takes longer than an uninterrupted one). Furthermore, since learners in all groups had as much time as they wanted, one can assume that they took as much time as they needed, and therefore the BL and PM groups would not benefit from being given extra time equivalent to that taken by the INT group.

Many researchers argue that feedback is important in SLA (e.g., Schachter, 1984; Swain, 1985; White, 1987). During interaction there are possibilities for NNSs to check their interpretations of L2 input, that is, to get feedback. NNSs can accomplish this through use of confirmation checks (e.g., "The *X*?") or clarification requests (e.g., "Which one?"). In the most successful interaction, NNSs will understand both (a) if they were right or not, and (b) if wrong, what the correct interpretation would have been. In a partially successful interaction, NNSs may at least know the former, but fail to determine the latter. In the worst case, NNSs will understand neither. Most likely, the degree of success in getting feedback falls along a normal distribution (from least to most), with partial success being the norm. For this reason, it was decided to provide partial feedback to learners in each treatment at the end of each task trial. This was done to block arguments that any advantage in acquisition for the interaction condition was due solely to the natural provision of feedback rather than to the effect of comprehension itself (cf. Faerch & Kasper, 1983; Pica et al., 1989; Schachter, 1984). Thus, when students announced that they had finished identifying the objects in a given picture sheet, the NS tutor took the sheet, checked its accuracy, and told them whether each choice was correct; tutors did not explain what would have been the correct choices and why.

Since learners can be exposed to a new vocabulary item repeatedly during interaction (e.g., when clarifying its meaning), all learners were given a minimal level of exposure to all (new and old) vocabulary items before beginning each set of tasks. Thus, for each task, students were shown a complete romanized list of its concrete nouns with their English equivalents. They were told how much time they had to study the list, allowing approximately 1 s to scan each printed word (both L2 and English). This was done for both theoretical and practical reasons: First, it would weaken arguments that the multiple exposures to new vocabulary items during negotiated interaction could explain any advantages in acquisition; second, it would lower the possibility of losing subjects in the noninteraction conditions (particularly the baseline) due to discouragement.

RESULTS

To determine the validity of the differences among treatment groups, all sessions of the INT group and a randomly selected third of each of the BL and PM groups' sessions were audiotaped. A systematic random sample of 15% of all taped sessions showed zero instances of negotiated interaction in the BL and PM groups, in contrast to numerous instances in the INT group. This confirmed that the tutors followed their instructions; the BL and PM group tutors only read the scripts, allowing no interaction, while INT group tutors negotiated interaction.

A more detailed descriptive analysis of the modifications of interaction and input in the INT group was also performed. Numerous instances of (a) clarification requests and confirmation checks by learners and (b) comprehension checks, repetitions, and elaborations by their tutors were found. Simple repetitions (which may be thought of as either an interactional or an input modification) were the most frequent interactional/input adjustment made by the tutors (see Loschky, 1989, pp. 78–79).

Comparisons of input complexity, in terms of syntactic complexity and length, were also made between groups using a T-unit analysis (see Harrington, 1986, for definitions when applied to Japanese).[12] The INT group heard input, across all three tasks, that was shorter (7.40 words per T-unit) than the BL group (8.52) or the PM group (8.58). Input to the INT group was also simpler (1.03 clauses per T-unit) than that in the PM group (1.29) and roughly equal with the input in the BL group (1.00). The PM group, on the other hand, heard, in Still Lifes and Maps tasks, input that was longer (8.37 words/T-unit) than either the BL group (7.00) or INT group (6.90). For these tasks, the PM group's input was also more complex (1.46 clauses/T-unit) than that in the BL group (1.00) or INT group (1.04). The PM group's added input, the additional sentence, was *elaborated* in comparison to the baseline in these two tasks. However, the PM group's input in the Shapes tasks (in which the added input was *simplified* in comparison to the baseline, while still adding redundancy in terms of repetition) was shorter (8.96 words/T-unit) than the BL group (11.66), while only slightly longer than the INT group (8.71). All of this is in accordance with the objectives of the study.

One further factor compared across groups was the degree of elaboration of input. For purposes of comparability with Pica et al. (1987), we will look at only one type of elaboration, *repetition* (Pica et al., 1987, referred to this measure as *redundancy*). In this study, elaboration was measured in terms of exact repetitions of key content words (concrete nouns and locative nominals) per baseline input sentence.[13] With an overall mean across groups and tasks of 3.05 repeated key content words/baseline sentence, the INT group heard the most repetitions (6.58), the PM group heard an intermediate number (2.58), and the BL group heard none. Furthermore, during the Shapes tasks, the INT group heard the greatest number of repetitions (13.57) of any group on any set of tasks.

Before testing the directional hypotheses of the study, the pretest results for both vocabulary recognition and sentence interpretation were compared across the three groups. For the sake of simplicity, only the results for those vocabulary items used in the listening tasks, both new and old, are presented. (In further analyses only the

results for the new vocabulary items used in the tasks are presented; see Loschky, 1989, for the complete results.) As expected, no significant differences were found among the groups prior to their respective treatments. The range of average scores among groups for new vocabulary items was from 23 to 25% correct. For old vocabulary, the range was from 94 to 96%. For sentence verification scores, collapsing across sentence types, the average scores ranged from 65 to 70%. Furthermore, it appears that while the material was not too difficult, there was still plenty of room for acquisition to occur; that is, there was a good chance of $i + 1$ material being available for acquisition.

With regard to the two locative sentence structures, there was an overall trend for learners to have more difficulty interpreting locative-initial sentences (65% correct) than subject-initial sentences (71%), but this trend was not significant. (For this reason, hereafter, results for both structures have been collapsed.)

Finally, as expected, a one-way ANOVA revealed significant differences between the scores of the second- and fourth-semester students on both the vocabulary recognition (new-used words, $F(df = 1) = 21.97, p < .05$) and sentence verification ($F(df = 1) = 14.96, p < .05$) measures. Again, by having two clearly differentiated levels of learner proficiency, the possibility of providing $i + 1$ input to at least one of the two levels is greater.

Effects of Input and Interaction Modifications

The results of the study confirmed Hypothesis 1, that negotiated interaction facilitates comprehension relative to noninteraction. However, Hypothesis 2, that premodified input facilitates comprehension relative to nonmodification of input and interaction, was not confirmed. Likewise, Hypothesis 3, that greater L2 comprehension leads to greater acquisition, was not confirmed.

On the basis of Hypothesis 1, we would predict that the INT group would have better online comprehension than either the PM group or the BL group. As can be seen in Table 1, the INT group had greater online comprehension of input than did either of the other groups for all tasks combined ($k = 36$). Table 2 shows a one-way analysis of covariance (ANCOVA) of total task scores by group, using the pretest scores from the sentence verification and vocabulary item recognition measures as covariates. This analysis showed a significant main effect for treatment ($p < .05$). A priori planned comparisons tested the hypothesized superiority of the INT group over the PM and BL groups. As predicted, the INT group had significantly better online comprehension than either the PM group ($t(df = 36) = 3.227, p < .05$) or the BL group ($t(df = 36) = 2.281, p < .05$) on the mean for all tasks combined.

Figure 1 shows the relationship among means for each group by task. Separate one-way ANCOVA indicated a significant main effect for treatment on each task (see Loschky, 1989, for details). However, further a priori comparisons showed that the INT group's superiority over both other groups was not significant for every task set. On the Shapes set the INT group comprehended significantly better than both the PM group ($t(df = 36) = 2.422, p < .05$) and the BL group ($t(df = 36) = 2.770, p < .05$). However, on the Still Lifes and Maps sets, the INT group only comprehended

Table 1. Scores on listening tasks by treatment group

	Treatment Group							
	BL (n = 14)		PM (n = 14)		INT (n = 13)		Total (n = 41)	
Task	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Still (k = 12)	.62	.22	.57	.27	.71	.23	.63	.24
Maps (k = 12)	.56	.23	.41	.20	.65	.28	.54	.24
Shapes (k = 12)	.40	.27	.43	.31	.64	.26	.49	.28
Total (k = 36)	.53	.21	.47	.23	.67	.23	.55	.22

Note: All figures rounded to the nearest hundredth. Still = Still Lifes task.

Table 2. One-way analysis of covariance for all tasks combined by treatment

Source of Variance	*SS*	*df*	*MS*	*F*
Covariates				
Voc. rec. pretest	.048	1	.048	1.944 n.s.
Sen. ver. pretest	.732	1	.732	29.572*
Main effects treatment	.362	2	.181	7.307*
Residual error	.891	36	.025	
Total	2.176	40	.054	

Note: Voc. rec. pretest = vocabulary item recognition pretest; Sen. ver. pretest = sentence verification pretest.
*$p < .05$.

significantly better than the PM group ($t(df = 36) = 2.265$, $p < .05$, and $t(df = 36) = 3.035$, $p < .05$, respectively). Differences in comprehension between the BL group and the INT group on these task sets were not statistically significant.

On the basis of Hypothesis 2, we would predict that the PM group would have greater online comprehension during tasks than the BL group. However, a priori comparisons found no significant differences between the PM and BL groups on any task set despite the appearance of differences in Figure 1.

On the basis of Hypothesis 3, we would predict that the INT group, which comprehended most, would score highest and make the greatest gains in both vocabulary recognition and sentence verification scores. With regard to the former measure, for clarity of presentation, only results for those new words used in the tasks will be discussed, though the results were parallel for all four categories of words (see Table 3). Using the learners' vocabulary item recognition and sentence verification pretest scores as covariates, one-way ANCOVAs were calculated for the recognition and sentence verification posttest scores. Neither analysis showed a significant main effect for treatment. Two-way ANCOVAs also found no significant interaction effects between treatment and proficiency level for either of the posttest measures, again using their respective pretest scores as covariates. Because level did not affect between-group variability on the independent variables, the issue of level is not dealt with hereafter.

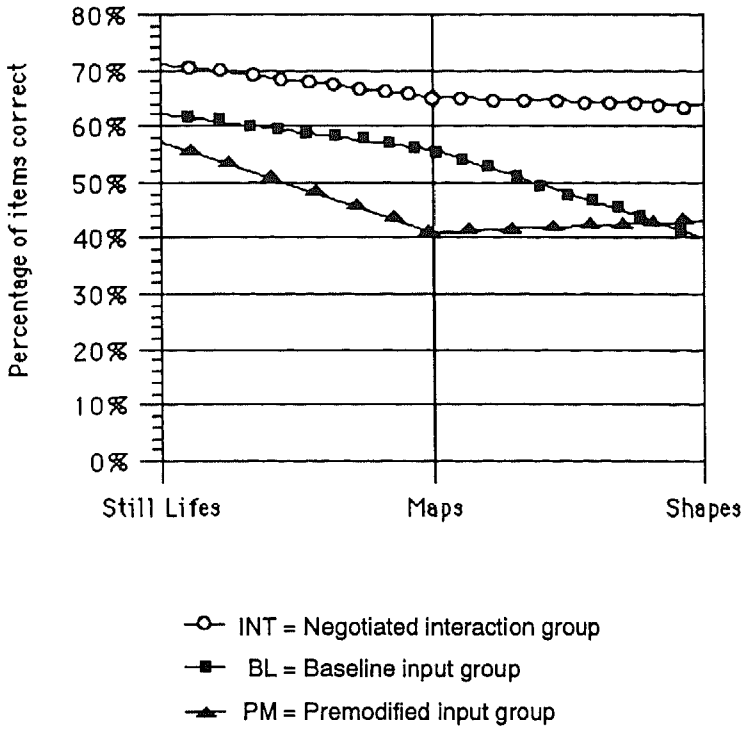

Figure 1. Listening task mean scores by group and task.

Table 3. Posttest vocabulary item recognition scores and sentence verification scores by treatment group

	Treatment Group							
	BL Group (n = 14)		PM Group (n = 14)		INT Group (n = 13)		Total (n = 41)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Voc. rec.[a] (k = 34)	.55	.19	.56	.23	.56	.15	.56	.19
Sen. ver. (k = 32)	.82	.15	.83	.17	.79	.18	.82	.16

Note: All figures rounded to the nearest hundredth. Voc. rec. = vocabulary recognition; Sen. ver. = sentence verification.

[a]Vocabulary recognition scores listed are only for those new words used in the listening tasks.

In sum, the results of the study showed no differences in retention/acquisition among the three groups. No significant relationships between variations in comprehension and acquisition were observed, either in Pearson correlation coefficients between online comprehension scores and pretest/posttest gains for lexical recogni-

Table 4. Gains from pre- to posttest in vocabulary item recognition scores and sentence verification scores for all groups

			t test		
Test	*M*	*SD*	*t*	*df*	2-Tailed Probability
Voc. rec. (k = 34)					
Pretest	.24	.14			
			−12.12	40	$p < .05$
Posttest	.56	.19			
Sen. ver. (k = 32)					
Pretest	.68	.19			
			−5.89	40	$p < .05$
Posttest	.82	.16			

Note: All figures rounded to the nearest hundredth. Voc. rec. = vocabulary recognition; Sen. ver. = sentence verification.

tion ($r = -.08$, $df = 41$, n.s.) or sentence verification ($r = -.17$, $df = 41$, n.s.). Thus, differences in levels of comprehension did not appear to affect acquisition. However, looking at the results for all conditions from pretest to posttest suggests that acquisition due to some factor shared by all three groups did occur. Table 4 shows the pretest/posttest gains for all subjects on the vocabulary recognition (k = 34) and sentence verification (k = 32) measures, respectively. *t*-tests indicated that the students made significant gains on both measures ($p < .05$). (Further analyses showed the same effects for each student group.)

DISCUSSION

This study provides mixed support for Long's (1980) revision of Krashen's (1980) input hypothesis and Krashen's (1983) more detailed proposal. The study provides clear support for Long's (1980) claim that negotiated interaction facilitates learners' moment-by-moment comprehension, as did the results of Pica et al. (1987). Thus, we can answer Aston's (1986) rhetorical question—Trouble shooting in interaction with learners: the more the merrier?—by stating that, all other things being equal, learners who are allowed to negotiate interaction while listening to the target language have a higher probability of comprehending what they hear—a point with important classroom implications.

The results also shed light on the possible effects task difficulty may have on the relationship between interaction and moment-to-moment comprehension. As shown earlier in Figure 1, the greater the overall task difficulty, the greater the effect for negotiated interaction. The Shapes task, which was the most difficult, brought out the overall main effect for interaction when the means for all three tasks were combined. One reason for the relative difficulty of this task may be that it contained longer utterances, in terms of words per T-unit, than the other tasks. Thus, this task clearly revealed the trend that was already evident in the other two, relatively

easier, tasks. Put most simply, the more difficulty the learner faces in comprehending, the more important negotiated interaction becomes.

However, the study also indicates that premodified input sometimes fails to improve learners' comprehension. Input in the INT group was more beneficial. In part, this must be because the interactional structure of the INT group discourse catered to learners' individual needs. It may also be due to characteristics of the input. As noted earlier, INT group input contained the most repetitions of key content words and had the least words per utterance, yet it was similar in syntactic complexity to the input in the baseline condition. The constraint that the PM group input could have only one sentence more than the baseline meant that greater redundancy was frequently achieved at the cost of longer sentences and greater syntactic complexity. Future studies should avoid this problem.

A more surprising finding was a lack of relationship between moment-to-moment differences in comprehension during the tasks and subsequent gains on the recognition and sentence verification measures. One possible explanation is the argument put forward by Sharwood Smith (1986); that is, that one may generally comprehend input at $i + 1$ by using comprehension strategies without turning it into intake, if one does not pay attention to linguistic forms while interpreting the input. However, in this case such an explanation fails because acquisition did occur; what instead must be explained is why there were no between-group differences in pretest/posttest gains on vocabulary recognition and sentence verification.[14]

On methodological grounds, since there was no pretest/posttest-only control group, it could be argued that the gains were simply due to test familiarity. However, this argument seems unlikely for the following reasons: (a) both tests contained approximately 50% filler items in order to avoid such an effect; and (b) it does not seem plausible to argue that taking the tests only once, with no knowledge of their results, could have led to the significant gains on the posttests. A ceiling effect explanation for the lack of between-group differences also fails, because even after the pretest/posttest gains, the learners still had room for improvement (the means are still at least 1 *SD* below a perfect score attained by NSs).

The most plausible explanation is that the acquisition was due to another common denominator of the three treatment groups: the "task-essentialness" of the forms (both morphosyntactic and lexical) (Loschky & Bley-Vroman, 1993). That is, in the tasks, it was "essential to attend to the relevant structure in order to perform the task successfully"; without attending to the forms it was impossible to succeed (p. 138). This task effect is precisely what has been argued for as a determinant of *noticing* and turning input into intake (Schmidt, 1990, p. 149). Thus, the results of this study suggest an important role for the comprehension process in SLA, though a more expanded one than that stated by Krashen.

Krashen's (1983, pp. 138–139) three stages in turning input into intake—(a) understanding an L2 $i + 1$ form (i.e., linking it to a meaning), (b) noticing a gap between the L2 $i + 1$ form and the current IL rule, and (c) reappearance of the $i + 1$ form with minimal frequency—may, with one critical modification, explain the equal and significant gains by both the lower and higher comprehending groups in this study. Recall that moment-by-moment comprehension was measured in terms of students'

interpretations of reversible locative sentences. The modification referred to is that, in some cases, learners will notice the gap precisely because they initially fail to comprehend a message containing the L2 $i + 1$ structure, that is, because of being faced with incomprehensible input (cf. Faerch & Kasper, 1986; White, 1987). Thus, by taking account of the importance of not only learners' comprehension successes but also their failures, that is, noncomprehension, we can explain the results of this study in terms of a revised form of the input hypothesis.

In addition to the above, it can be argued that three factors that were present in this study may have facilitated the noticing of IL gaps when learners failed to comprehend. The first was reliable feedback indicating success or failure in comprehending the L2 structures, and the second was that the L2 structures contained clear form : meaning relationships.[15] Finally, in congruence with Krashen's third stage in turning input to intake, the L2 structures appeared in the input repeatedly, thus allowing the learners to confirm their revised IL hypotheses. These factors are worthy of further investigation in future studies of comprehension and acquisition.

Earlier, it was noted that Doughty's (1991) finding of no differences in acquisition between students who differed in terms of comprehension might be attributed to equal attainment of some, as yet unspecified, minimum necessary level of comprehension. Obviously, the same could be said for this study, but this seems, at best, to be a convenient escape hatch allowing the input hypothesis to remain unchanged in the face of disconfirming data. Instead, it seems that the results of both this study and that of Doughty (1991) suggest that positing a linear relationship between comprehension of input and intake of the structures contained therein may be untenable. Though both studies clearly showed significant gains after participation in comprehension-based language activities, acquisition of structures did not covary with levels of comprehension. Thus, while the role of the comprehension process in acquisition appears to be quite strong, it also seems much more complex than previously suggested by the input hypothesis.[16]

This study reaffirms the important roles of both input and interactional features in learner comprehension. On the other hand, it also suggests a wider role for the comprehension process in SLA that incorporates both successes and failures. For the moment at least, it seems that positing a simple linear relationship between comprehension and intake is not warranted. Thus, there is a need for more studies that investigate the relationship between comprehension and acquisition, that is, studies that trace the path from specified input through comprehension to intake and retention.

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NOTES

1. Doughty's (1991) study was published well after the research reported here was completed. Thus, her findings did not affect the formulation of the hypotheses tested in this study. Nevertheless, Doughty's findings are extremely relevant to the present paper and have therefore been included.

2. A chi-square analysis showed no significant differences in terms of level among groups at the .05 level.

3. Unfortunately, no data were available on subjects' oral proficiency. However, as the focus of the study was primarily on the learners' development in terms of comprehension rather than in terms of production, this was not seen as a critical problem.

4. In this study, two of the four possible combinations of the two sentence structures and the two particles, WA and GA, were used. In sentences of the type shown in (1), the subject noun was marked by GA, and in sentences of the type shown in (2), it was marked with WA. This matched the presentation of these sentence types in the subjects' course textbook (Jorden, 1963, lesson 6) and that of many other beginning JFL textbooks.

5. In the case of bird's-eye-view (flat) representations of space (e.g., in maps), care must be taken to ensure that viewers assume the correct viewpoint toward the depicted reference points. Thus, for example, in depicting two locations on a street map, it is important that the viewer understand which direction, either up, down, left, or right, is meant when one says, for example, "the *X* is past the *Y*." For this reason, the tasks in this study that utilized maps all had viewpoint indicators on them. A viewpoint indicator took the form of a stylized drawing of a face looking at the map from the necessary viewpoint, with arrows extending out from the face showing what could be seen from that viewpoint. Before students were given Map tasks or test items, they were given example tasks and test items in English with instructions on how to interpret the viewpoint indicators. Then, as was the case for all tasks and test items, the correct responses for the examples were given. Finally, students were encouraged to ask the researcher questions before beginning the tasks or tests if they could not understand something.

6. It is important to note that 3 of the 41 subjects (one per treatment) had a Chinese dialect as their native language. However, pilot testing of the measures in the study found that beginning-level Chinese learners of Japanese had difficulties similar to English speakers in interpreting Japanese locative sentences. Furthermore, the small number and equal distribution among treatments of these subjects precludes the possibility of their having altered the principle findings of the study regarding the effects (or the lack thereof) of input and interaction on acquisition.

7. The slight difference in the number of words in the new (used) and old (used) categories is due to the limited number of nouns used in the Shapes task. There were four new shape nouns used in the task, but no corresponding old nouns to match against them. This was because no shape nouns were taught in the first-semester textbook.

8. Cronbach's alpha was calculated for the 128-item vocabulary recognition pre- and posttests, resulting in reliability coefficients of .89 and .90, respectively. Two native speakers who took the pretest recognized 100% of the items.

9. Cronbach's alpha results for the 32-item sentence verification pre- and posttests were .85 and .86 for the two testings, respectively. The test was also administered to two native speakers, who scored 100 and 99%, indicating that the test was clear and understandable to a fully proficient speaker.

10. There was one additional description + target object per picture sheet that was intended to be easier for the students and was considered as a "filler." These items used a simple Existential + Adjective + Noun structure, and the results obtained from them were not included in the analysis. Nevertheless, a small percentage of the new vocabulary items were introduced only in the filler task items (6 of 34 = 18%).

11. Cronbach's alpha was calculated for each of the three 12-item task sets. The reliability coefficients were .73, .74, and .83 for the Still Lifes, Maps, and Shapes task sets, respectively, reasonably high for tests having 12 items.

12. Figures are derived from 100% of the BL and PM groups' scripted corpus and, for the INT group, from a sample of the first 100 T-units in the random sample of the entire corpus.

13. Figures are based on the first 100 T-units in a random sample of the entire corpus of the INT group and the corresponding input from the BL and PM groups.

14. This explanation was entertained in Loschky (1989). However, after further consideration, it seems clear that such an explanation is wrong.

15. This is not to say that clear form : meaning relationships are necessary for SLA. Rather, such relationships should make it easier for learners to notice gaps in their IL rules when faced with incomprehensible input.

16. It might be argued that the lower comprehending, "rule-oriented" group in Doughty's (1991) study was using, as Krashen (e.g., 1985) puts it, *learned* rather than *acquired* competence, and Krashen argues that there is no relationship between comprehension and learning. There is no space here to discuss the validity of this distinction (see Gregg, 1984; McLaughlin, Rossman, & McLeod, 1983; for criticisms). However, when applied to this study, such an argument would not only lack face validity but would also be impossible to prove.

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