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ATTENTION AND L2 LEARNERS' SEGMENTATION OF COMPLEX SENTENCES

by

Akiko Hagiwara

An Abstract

Of a thesis submitted in partial fulfillment
of the requirements for the Doctor of
Philosophy degree in Second Language Acquisition
in the Graduate College of
The University of Iowa

July 2010

Thesis Supervisor: Professor Richard R Hurtig

ABSTRACT

The main objective of the current study is to investigate L2 Japanese learners' ability to segment complex sentences from aural input. Elementary- and early intermediate-level L2 learners in general have not developed the ability to use syntactic cues to interpret the meaning of sentences they hear. In the case of Japanese, recognition of inflectional morphemes is crucial for the accurate segmentation of complex sentences, as they signal the end of each clause. However, recognition of inflectional morphemes was found to be challenging for low-proficiency learners because they are often fused in natural speech; thus, they are low in salience.

To assist L2 learners in finding meaningful chunks, namely clauses within a complex sentence, the current study attempted to focus their attention on inflectional morphemes in aural input. During the experiment, learners were asked to repeat complex sentences as accurately as possible. Half of the stimuli were accompanied by pictures that corresponded to the activities described in the complex sentences. The study hypothesized that visualized chunks would reduce L2 learners' cognitive load and enable them to pay closer attention to syntactic elements; thus, learners would reconstruct complex sentences better with pictorial information support. It was also hypothesized that the ability to reconstruct elements that are low in salience would account for L2 learners' receptive proficiency.

The results revealed that L2 learners' reconstruction of complex sentences improved significantly with the support of visualized chunks. However, it became evident that learners' reconstruction of an inflectional morpheme to which they had not been fully exposed in class did not improve with the pictorial support. Such a tendency was particularly obvious when the inflectional morpheme was located in a sentence-internal position. Additionally, the study found that L2 learners' ability to reconstruct an inflectional morpheme declined when it was devoid of communicative value. In terms of

receptive proficiency, the results indicate that L2 learners' ability to reconstruct syntactic elements that are low in salience is a reliable predictor of their receptive proficiency.

Abstract Approved: _____
Thesis Supervisor

_____
Title and Department

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Date

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Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

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PH.D. THESIS

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This is to certify that the Ph.D. thesis of

Akiko Hagiwara

has been approved by the Examining Committee
for the thesis requirement for the Doctor of Philosophy
degree in Second Language Acquisition at the July 2010 graduation.

Thesis Committee: _____
Richard R. Hurtig, Thesis Supervisor

_____
William Davies

_____
Judith Liskin-Gasparro

_____
Seiichi Makino

_____
Bruce Spencer

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I first learned about the Oral Proficiency Interview (OPI) developed by American Council on the Teaching of Foreign Languages (ACTFL) back in the summer of 1996. Since hearing Dr. Makino of Princeton University lecture about the OPI during a course in the MA program at Columbia University, I was fascinated with the idea of measuring learners' proficiency based on their oral communication abilities. I always felt that there was a great discrepancy between what language learners know and their ability to communicate, and wondered why such discrepancies occur.

Since then, I have tried to teach students in a way that enables them to perform well on the OPI, which Dr. Makino suggested during his lecture. I obtained the OPI tester certification in 2001 while I was teaching Japanese at Michigan State University. My desire to investigate learners' ability in terms of their perception and production continued to grow. I finally decided to pursue a degree in second language acquisition. It was indeed a difficult decision to make, considering that it had been six years since I completed my MA, and that I lacked research experience using statistics. I was extremely fortunate that FLARE gave me a chance to pursue this degree.

Looking back my experience as a PhD student, the first semester was very challenging. Adjusting myself to life in Iowa City, fulfilling my duties as a TA, learning theories from scratch, and worrying about my mother's health all imposed burdens on my mind. However, the joy of learning new theories in second language acquisition and conducting research projects prevailed after the first semester. Throughout my experience in the University of Iowa, I was always surrounded by wonderful friends, professors and students. These people definitely supported me in my studies and research.

There are too many people to whom I would like to express my gratitude. First, I would thank my thesis advisor Dr. Richard Hurtig for his tremendous support. I was thrilled to conduct my PhD project under his direction. Without his advice, the

experience of writing a dissertation would not have been so rewarding. I am extremely fortunate to have an advisor like Dr. Hurtig who does not mind spending many hours discussing my project, despite his extremely busy schedule. I am also extremely grateful to the other committee members, Dr. William Davies, Dr. Judith Liskin-Gasparro and Dr. Bruce Spencer, for their valuable advice. I was very fortunate to include Dr. Makino from Princeton University as a member of my dissertation committee.

Upon completion of my dissertation, I would like to extend my gratitude to the Japan Foundation for allowing me to use the Japanese Proficiency Test. I greatly appreciate my Japanese TA friends' valuable comments in improving the stimuli I used for my experiment. I also thank friends in Phillips Hall for their suggestions to improve the quality of the more than 100 pictures that were part of my experiment. Fortunately, my experiment with these pictures went very smoothly with the help from Greg Johnson of the Language Media Center. I highly appreciate his valuable suggestions regarding the instruments that I used in my experiment. The Writing Center at the University of Iowa and my English editor Micah Stack helped me improve the quality of my English, and I greatly appreciate their time and effort. Thesis writing was indeed a positive learning experience, allowing me to leave the FLARE program with knowledge I can continue to use when conducting research studies in the future. I also would like to thank my parents and sisters for allowing me the time to study at the University of Iowa. Now I am determined to make up for the time I was unable to help them in the past. Last but not least, I thank my husband Yoshihiko for enlightening my life ever since I met him.

In closing, I would like to reiterate the lesson I learned from Dr. Kathy Heilenman, who was the co-director of FLARE. She inspired her students by showing the importance of being positive all the time, and she demonstrated how such an attitude made her a great scholar and a great mentor. I will continue to hold what she taught in memory as I pursue my career.

ABSTRACT

The main objective of the current study is to investigate L2 Japanese learners' ability to segment complex sentences from aural input. Elementary- and early intermediate-level L2 learners in general have not developed the ability to use syntactic cues to interpret the meaning of sentences they hear. In the case of Japanese, recognition of inflectional morphemes is crucial for the accurate segmentation of complex sentences, as they signal the end of each clause. However, recognition of inflectional morphemes was found to be challenging for low-proficiency learners because they are often fused in natural speech; thus, they are low in salience.

To assist L2 learners in finding meaningful chunks, namely clauses within a complex sentence, the current study attempted to focus their attention on inflectional morphemes in aural input. During the experiment, learners were asked to repeat complex sentences as accurately as possible. Half of the stimuli were accompanied by pictures that corresponded to the activities described in the complex sentences. The study hypothesized that visualized chunks would reduce L2 learners' cognitive load and enable them to pay closer attention to syntactic elements; thus, learners would reconstruct complex sentences better with pictorial information support. It was also hypothesized that the ability to reconstruct elements that are low in salience would account for L2 learners' receptive proficiency.

The results revealed that L2 learners' reconstruction of complex sentences improved significantly with the support of visualized chunks. However, it became evident that learners' reconstruction of an inflectional morpheme to which they had not been fully exposed in class did not improve with the pictorial support. Such a tendency was particularly obvious when the inflectional morpheme was located in a sentence-internal position. Additionally, the study found that L2 learners' ability to reconstruct an inflectional morpheme declined when it was devoid of communicative value. In terms of

receptive proficiency, the results indicate that L2 learners' ability to reconstruct syntactic elements that are low in salience is a reliable predictor of their receptive proficiency.

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CHAPTER I

MOTIVATION FOR THE STUDY

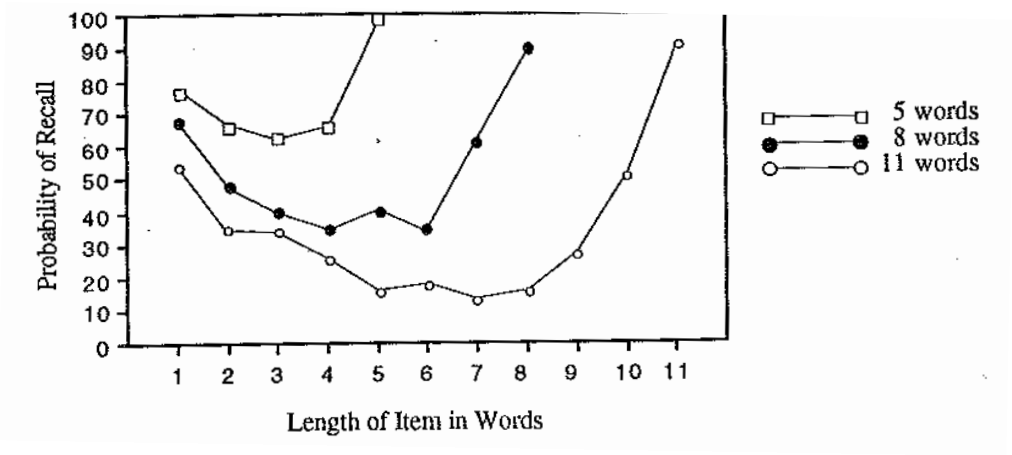
Introduction

The role of attention in the acquisition of L2 features has been extensively discussed in the realm of second language acquisition (hereafter SLA) since Schmidt (1990) introduced the Noticing Hypothesis. The current study seeks solutions for overcoming one of the problems L2 learners face while incorporating factors proposed by Schmidt. One of the major challenges for L2 learners is to process and produce complex sentences during spontaneous communication. In order to perform well in such a situation, learners need to find meaningful units from aural input. It has been argued that learners' working memory (hereafter WM) influences their ability to recognize meaning chunks (N. Ellis, 1996; 2001). Paying attention to certain elements in aural input is challenging for most elementary and early-intermediate L2 learners, because of the difficulty of keeping information in memory. Learners with low WM capacity have a particularly hard time directing their attention to aural input.

Previous studies investigating L1/L2 language development have found a phenomenon termed *serial order effect* (Lewandowsky & Murdock, 1989; Spitze & Fischer, 1981). That is, learners have difficulty in recalling the intermediate items of a sound string. This phenomenon is observable when language learners are asked to repeat a sentence from aural input. Figure 1 illustrates L2 learners' performance on processing aural input. The dips indicate locations of elements which learners did not process well. Typically, the horizontal lines decline most in the sentence-internal position. The current study assumes that the serial order effect causes serious parsing problems for low WM capacity learners. Processing of long sentences is considered to be challenging, because such sentences contain multiple elements in the middle. If a learner's WM capacity is low,

sentence-internal elements may quickly disappear from memory. Therefore, parsing of the entire sentence becomes difficult as sentence length increases.

Figure 1.1. Serial Position Curves for Different List Lengths. Adapted from Lewandowsky and Murdock (1989)



Bley-Vroman and Chaudron (1994) point out that the serial order effect is influenced by the length and complexity of the input. However, the degree of complexity that may cause the serial order effect has not been fully investigated. In addition, no study thus far has examined the serial order effect with L2 learners of Japanese. By examining the way L2 learners reconstruct complex sentences, this study offers possible assistance to L2 learners in finding meaningful units in aural input, which may later enable them to reconstruct meaningful sequences in the L2.

Existing Problems in Japanese L2 Learners' Free Production

When elementary- and intermediate-level Japanese L2 learners are asked to perform a free production task such as a picture description or an interview, they tend to produce relatively short and simple sentences. Kondo (2004) found that intermediate-level Japanese L2 learners tended to use the conjunctions *soshite* 'and' and *demo* 'but' when creating cohesiveness in a sentence. On the other hand, L1 speakers rarely used *soshite*. Instead, they used a variety of verb morphologies to create cohesiveness. Kondo discovered that the number of verb forms found in L2 learners' utterances was considerably fewer than those in L1 speakers' utterances. The lack and misuse of cohesive devices in L2 learners' production have been also discussed in other Japanese pedagogy literature (Ichikawa 1997; Kiyama, 2003). These studies suggest that creating cohesion using inflectional morphemes is considerably challenging for Japanese L2 learners whose native languages do not have inflection systems. Unpacking L2 learners' difficulty in using cohesive devices in free production may give us insight as to how to assist them in performing well in online tasks that learners frequently experience outside of classroom, such as a description of an event or a conversation with a native speaker.

Japanese Inflectional Morphemes

The lack of cohesive devices in elementary- and early-intermediate-level L2 Japanese learners' utterances reveals the difficulty of acquiring Japanese inflectional morphemes. Morphology in general is one of the hardest areas for L2 learners to acquire (DeKeyser, 2005), and the difficulties have been reported in a number of studies (e.g. Artificial language verb plural marker by N. Ellis & Schmidt, 1997, English third person singular marker by R. Ellis et al, 2006; Russian verb conjugation by Gor & Cook, 2010; Russian noun gender markers by Kempe, et al., 2010; German nominals by Parodi et al., 2004). In many other languages, verb inflectional morphemes indicate information such

as subjects, number of subjects and tense. The difficulty of morpheme acquisition is typically associated with the agreement among subject, number, tense and gender, etc. However, none of the above mentioned studies has addressed the specific problem associated with Japanese morphemes.

The problem L2 Japanese learners face is unrelated to agreement, as Japanese inflectional morphemes do not carry these kinds of information. Japanese is devoid of gender distinctions or number agreements. Similar to many other languages, tense is realized by adjective or verb inflection, but only in a sentence final predicate. Therefore, inflectional morphemes located in the sentence-internal position do not carry information about tense. Instead, they indicate how clauses relate to each other, and create cohesiveness between clauses. For example, an inflectional morpheme *-te* indicates activities that take place in a chronological order, and an inflectional morpheme *-tari* show examples of activities in no particular order. The following shows an example. Inflectional morphemes *-te* and *-tari* are underlined.

[*uchi e kaette*] [[*inu to asondari*[1]] [*benkyoo shitari*] *shimasu*].
= [I'll go back home, then] [do things like [play with my dog], [study] etc].

All Japanese textbooks for L2 learners introduce these inflectional morphemes in the early stage of curriculum. However, as previous studies report, a lack of inflectional morphemes is common in elementary and early-intermediate L2 learners' utterances (Ichikawa, 1997; Kiyama, 2003; Kondo, 2004). Without these inflectional morphemes, the entire sentence lack cohesiveness, resulting in juxtaposition of discrete sentences as shown below.

---

[1] *-tari* changes to *-dari* when the plain form of a verb ends with *–mu*, *-bu*, *-nu* or *-gu*.

[*uchi e kaerimasu*]. [*inu to asobimasu*]. [*benkyoo shimasu*].

= [I'll go back home]. [I'll play with my dog]. [I'll study].

For L2 Japanese learners, recognition of inflectional morphemes is important for the comprehension of the entire sentence. The default Japanese word order is SOV, so that verb inflectional morphemes are located in the end of each clause. In order to parse a Japanese complex sentence, L2 learners need to identify boundaries between clauses. If they are capable of recognizing inflectional morphemes in each clause, parsing of complex sentences should not be too difficult, as inflectional morphemes signal the end of a clause. However, investing attention to inflectional morphemes is indeed challenging for them, considering the fact that inflectional morphemes are always located somewhere in the middle of a sentence. Elements in the internal position are particularly vulnerable to the serial order effect, because they are low in salience in terms of location. Finding a conjunction is much easier than finding an inflectional morpheme, because a conjunction such as *soshite* 'and' and *demo* 'but' are always located at the beginning of a sentence. Location and function of inflectional morphemes both account for L2 Japanese learners' preference for conjunctions over inflectional morphemes.

Japanese Verb Conjugation

To process and produce Japanese inflectional morphemes, L2 learners must know how verbs are conjugated according to each inflectional morpheme. In other words, each inflectional morpheme requires specific verb conjugation rules. Conjugation rules differ depending on three types of verbs: the *u*-verbs, the *ru*-verbs, and irregular verbs. Before applying conjugation rules, learners must identify the verb type. There are only two irregular verbs ('to do' and 'to come'), so that they are easily identified. The distinction between the *u*-verbs and the *ru*-verbs is made by the ending of a verb. If a verb ends with

either *-eru* or *-iru*, they are defined as the *ru*-verbs[2], and the rest of the verbs are the *u*-verbs. L2 learners must memorize conjugation rules every time a new inflectional morpheme is introduced.

L2 Japanese learners need to go through four steps to process or produce an appropriate inflectional morpheme. For instance, if learners wish to say "I'm going home and then will watch TV," they must pick appropriate lexical items in Japanese: *uchi ni kaeru* ('go home') and *terebi o miru* ('watch TV). Second, learners must identify that *kaeru* is a *u*-verb[3], and *miru* is a *ru*-verb. Third, they need to select the appropriate inflectional morpheme that matches their communicative intention. In this case, appropriate form for *kaeru* is the *te*-from to describe a situation where 'go home' and 'watch TV' occur in a sequence. Finally, a learner must conjugate the verb *kaeru* 'to go home' to fit the *te*-form, and express *miru* in the *–masu* to signal the end of a sentence.

DeKeyser (2005) argues that the difficulty of a form can be determined by number of rules a learner needs to apply to deliver it. Considering the number of rules L2 Japanese learners need to apply, verb conjugation may be one of reasons that elementary-level L2 Japanese learners avoid inflectional morphemes in free production.

Difficulty of Accessing Explicit Knowledge

Considering the time Japanese L2 learners spend learning a variety of cohesive devices in the classroom, the paucity of such devices in free production tasks is problematic. The lack of cohesive devices may be an indication that a variety of inflectional morphemes is not yet internalized in L2 learners' interlanguage system. Further, the explicit knowledge L2 learners have gained in class is not used - or may be inaccessible - during online tasks. R. Ellis (2004) argues that explicit knowledge is

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[2] Some verbs end with *-eru* or *–iru* are classified as *u*-verbs. They are treated as exceptions.

[3] *Kaeru* (go home) is one of the verbs that is categorized as a u-verb despite its ending with *-eru*. For novice Japanese learners, knowing verbs that are considered to be exception may be another obstacle they need to overcome.

accessible through controlled processing. Studies have suggested that L2 learners need planning time in order to use their explicit knowledge (R. Ellis, 2004; R. Ellis & Yuan, 2005). Elementary and early-intermediate Japanese L2 learners' inability to create cohesive devices during an online task can be explained by the lack of planning time that is necessary to use explicit knowledge. Gathering different knowledge to create cohesiveness may cause cognitive overload. When they are not given time to plan, they may resort to a quick and easy solution, which may result in lacks complexity during online tasks.

R. Ellis and Yuan (2005) discovered that L2 learners' grammatical accuracy was improved when they were given time to plan on-line during narrative tasks. Skehan (1998) and Skehan and Foster (1997) also investigated how planning time would contribute to the quality of L2 learners' production, and discovered that complexity increased when learners were given time to plan. In general, L2 learners are taught grammar rules explicitly in class. They may be able to perform well when they are given time to retrieve the explicit knowledge they have gained. However, in situations where they do not have enough time to organize knowledge they learned, such as narration or an interview, they have a hard time accessing explicit knowledge to create cohesiveness.

Contribution of Implicit Knowledge

R. Ellis (2004) suggests that implicit knowledge facilitates automatic processing and production. If this holds true, during an online task such as spontaneous free production, learners need to gain access to implicit knowledge. Unlike adult L2 learners who generally gain knowledge explicitly in class, L1 children acquire their native language implicitly by learning instances of the language use, and gradually learn to produce longer chunks (N. Ellis, 2001; Lieven & Tomasello, 2008). In sum, L1 children learn their native language implicitly as a result of frequent exposure to input (Bybee, 2008; N. Ellis, 2002; Lieven & Tomasello, 2008). According to Bybee, frequent exposure

to a language enables L1 children categorize input, and stored information in memory forms the basis to learn a novel construction. L1 children learn language by hearing sequences without realizing internal structures and are able to produce language spontaneously. She claims that the same learning mechanism should work for L2 learning as long as L2 learners receive sufficient exposure that enables them to categorize input. It is generally agreed that L2 learners need to be exposed to the target language frequently to make implicit learning effective (Ellis & Schmidt, 1997; Lieven & Tomasello, 2008). Implicit learning takes time until sufficient data are stored in memory. Frequency of exposure is exactly the problem L2 learners face. In general, L2 learners do not have plentiful opportunities to be exposed to a target language.

Working Memory and Recognition of Meaningful Sequences

Implicit learning is facilitative for the development of the ability to parse sequences instantly, which does not require analysis of individual lexical items. In order to accomplish instant parsing from a sound stream, learners must recognize boundaries between sequences. Previous studies have found that children possess language-specific sensitivity for recognizing boundaries that exist between sound sequences from a very early age (Nazzi, Bertonchini & Mehler, 1998; Nazzi, Nelson, Jusczyk & Jusczyk, 2000). Thus, L1 children are capable of processing input instantly. Doughty (2003) suggests that L2 learners should also be trained to pay attention to cues that indicate phrasal and clausal boundaries, as children do when they learn their L1 implicitly. However, for L2 learners, recognition of boundaries is hard to accomplish. Ellis (2008) points out that bound morphemes are hard to detect despite their frequency in input, because boundaries become blurred in rapid speech.

Then, the question arises as to whether L2 learners are able to recognize meaningful sequences if boundaries are made salient for them. A study by Blau (1990)

revealed that L2 learners' listening comprehension increases when there are pauses between meaningful boundaries, even when sentences are read at a natural speed. Blau's study indicates that recognition of boundaries leads to better processing of sound streams. According to Newell (1990), a new chunk is formed by welding a set of already created chunks in memory, suggesting that a large WM span is required to connect new input to old information for the creation of larger chunks. The notion of memory span and chunking was first introduced by Miller (1956). He stated that learners acquire the ability to analyze an utterance in larger chunks as their language skills develop. For language learners, having strong phonological short-term memory (hereafter STM) is thus advantageous to integrate new and old chunks in memory.

However, STM is subject to decay. In particular, the information located in the middle of a sound stream is difficult to hold in memory (serial order effect as mentioned in the previous section). It is thus reasonable to expect that learners with high WM capacity are able to process and create complex sentences, because such learners are able to remember syntactic elements in the middle of a sentence.

Visualization of Boundaries in a Sound Stream

The current study argues that L2 learners' serial order effect is due mainly to their inability to find meaningful chunks in a sound stream. For instance, if a novice Japanese L2 learner listens to the following sentence, he or she may not notice that the entire sentence consists of multiple VPs:

Uchinikaettarahonoyondariinutoasondarishimasu.

(= When I go home, (I'll) do things like read books and play with my dog, etc.)

The above sentence sounds like a long chunk for novice learners, unless they recognize the inflectional morphemes that indicate boundaries between clauses. As the

sentence length increases, the number of verb inflections in the middle of a sentence and their complexity may also increase. The length and complexity together make it difficult for novice learners to find chunks, which results in the serial order effect. To enable L2 learners to find chunks, as Doughty (2003) suggests, learners' attention needs to be drawn to the boundaries between meaningful chunks. L2 learners' online performance may improve by bringing their attention to the particular parts of a sequence that signal boundaries.

For adult L2 learners, finding boundaries in a sound stream is difficult for many reasons. Unlike written language, spoken language is highly variable because exactly the same words have different sound qualities depending on the speaker. Additionally, overlap of phonemes occurs in natural speech so that boundaries become ambiguous (N. Ellis, 2008). In a written language, on the other hand, a reader can observe the linearity of a sentence from strings of characters. In addition, a space, comma, and period display boundaries for a reader. In spoken language, such valuable information is invisible; thus linearity is much more difficult to recognize compared to written language.

In order to overcome the above difficulties, the current study offers a solution by making the boundaries between clauses salient. It hypothesizes that L2 learners will be able to recognize visually displayed boundaries, such as those shown in Figure 2. Pictures carry three distinct important sets of information in the current study. First, they indicate boundaries between meaningful chunks, and this enables learners to dissect a sound stream into four VPs. Second, they immediately communicate learners to lexical information of a sentence. Third, they represent the sequence of events described in a sentence.

Figure 1.2. Model of a Sentence Broken into Meaningful Chunks

Uchi ni kaettara	*hon o yondari*	*inu to asondari*	*shiasu*[4]
When I go home	I'll do things such as read books,	play with my dog,	etc.

Elicited Imitation as a Tool for Facilitating L2 Learners' Online Processing

Thus far, WM capacity has been found to be a crucial factor for language acquisition (N. Ellis & Schmidt, 1997; Robinson, 2003). The contribution of WM to language development has been tested by various researchers using Elicited Imitation (hereafter EI), which has been widely used to examine both child and adult L2 learners' grammatical development (Bley-Vroman & Chaudron, 1994; Erlam, 2006; Vinther, 2002). During EI, learners are asked to repeat a given sentence as accurately as possible. The basic assumption is that if learners' interlanguage system is close to a given cue, their imitation of the cue should be accurate. Therefore, learners' performance under this task is most likely a reflection of their interlanguage system (Mackey & Gass, 2005). In other words, learners' failure to correctly repeat a sentence may indicate that their interlanguage system has not fully developed to properly reconstruct a given sentence.

[4] "*Shimasu*" (=to do) following the *tari* form does not represent any activity. It is used to coordinate the previous two verbs in the *tari* form; therefore, the last slot is left blank.

The current study claims EI may also be used to sensitize L2 learners' awareness about their current level of interlanguage, because failure to produce accurate imitation of particular grammatical elements or lexical items immediately communicates to learners the lack of such items in their interlanguage. In order to perform well on EI, learners must invest their attention in a sound sequence. Researchers have argued that attention is the key ingredient for successful second language acquisition (Schmidt, 1990, 2001; Slobin, 1993) and attention should be invested in key elements of a target language (Doughty, 2003; Robinson, 2003; Schmidt, 1990, 2001). Therefore, EI can facilitate L2 learners' awareness of linguistic elements because it encourages learners to pay close attention to aural input. Second, EI enables a researcher to provide learners with target structures and lexical items implicitly. Since implicit knowledge is considered to play a major role during an online task (R. Ellis, 2004), EI is adequate for facilitating L2 learners' online processing. Third, EI immediately communicates to learners the lack of particular grammatical elements or lexical items in their interlanguage when they fail to produce accurate imitation. This may lead to L2 learners' "noticing the gap," which raises L2 learners' awareness about their current level of interlanguage (Swain, 1995, 1998, 2005).

Research Questions and Hypothesis

Based on the arguments mentioned above, the following questions are addressed in this study to examine L2 learners' perception and reconstruction of meaningful sequences. The current study intends to identify the difficulties L2 learners face during an online task and establish a possible solution for overcoming such difficulties.

1. Does pictorial information aid Japanese L2 learners' repetition of inflectional morphemes or lexical items?
2. Does the location of syntactic elements in a complex sentence (multiple VPs) affect Japanese L2 learners' ability to repeat the sentence accurately? In

particular, are elements located in the middle of a sentence more difficult to repeat than elements in the beginning or ending position?

3. Does learners' familiarity with inflectional morphemes increase their success in repetition?
4. Can L2 learners' ability to repeat complex sentences from aural input account for their receptive proficiency?

The above questions are raised based on the following hypotheses. Question 1 is based on the assumption that pictorial information helps L2 learners to invest their attention in clause boundaries. Additionally, L2 learners are able to retrieve lexical information from pictorial information; as a result, they are able to focus more attention on syntax. As for question 2, the study hypothesizes that both the location of syntactic elements and familiarity of forms affect L2 Japanese learners' parsing. Specifically, the form located either at the beginning or at the end of a sentence is more likely to be recalled than the same form located in the middle of a sentence. Therefore, it is expected that L2 learners imitate phrases in sentence-initial and sentence-final positions more successfully than phrases in sentence-internal positions. Concerning question 3, linguistic items to which learners have been exposed for a longer time is more likely stored in their memory. Therefore, length of exposure to inflectional morphemes predicts the likelihood of successful reconstruction. Regarding question 4, this study assumes higher-proficiency Japanese L2 learners are less susceptible to the serial order effect. They are able to direct their attention to elements in sentence-internal position, and they are more capable of reconstructing complex sentences.

CHAPTER II

REVIEW OF THE LITERATURE

Overview of the Chapter

The intent of this chapter is to identify known problems relating to L2 learners' processing of input and possible solutions to overcome difficulties in processing L2 sentences from a sound stream. This chapter first introduces the possible reasons for L2 learners' difficulties with automatic processing. Particular attention is paid to the availability of implicit and explicit knowledge to L2 learners. Second, the way L1 and L2 learners develop segmentation skills is described. The discussion mainly deals with L2 segmentation problems; that is, L2 learners' difficulty in recognizing non-salient parts of a sentence. How to bring learners' attention to a part of a sentence that is important but not salient has been a major issue in SLA. The chapter continues with a discussion of awareness and attention in relation to the Noticing Hypothesis by Schmidt (1990, 2001). This discussion highlights the factors that may influence learners' ability to notice an element in input. Additionally, issues related to working memory (hereafter WM) and sentence processing are presented. The literature suggests that WM is one of the major factors that facilitates intake from input, and empirical research that explores the effective use of WM is described. The chapter concludes with a discussion of a technique called Elicited Imitation (hereafter EI). Studies in both in L1 and L2 acquisition have shown that EI is closely tied to learners' WM capacity. Benefits and limitations of EI are also presented.

Implicit and Explicit Knowledge

As discussed in the previous chapter, lack of complexity in novice and intermediate levels of L2 learners' production during online tasks, such as an interview, may be explained by their difficulty in retrieving declarative knowledge. One of the most serious problems in L2 is the gap between knowledge and performance, especially under

time constraints. For instance, R. Ellis et al. (2006) found that L2 learners have problems perceiving the English past tense marker *-ed* despite the knowledge they possess. Thus, in their study, R. Ellis et al. suggest that explicit knowledge alone does not enhance L2 learners' performance. Implicit knowledge is also necessary to enable L2 learners to respond to input automatically. Implicit and explicit knowledge contribute to L2 learning in different areas. Implicit learning facilitates fluency (N. Ellis, 2002), while explicit learning is effective for learning complex systems, such as long distance dependencies (DeKeyser, 2003; N. Ellis 2005) and monitoring of one's own production (N. Ellis, 2005). The following section discusses how each knowledge type contributes differently to SLA.

Contribution of Explicit Knowledge to SLA

In most L2 classrooms, implicit learning is hardly the center of instruction. It is commonly assumed that explicit instruction is beneficial because it speeds up language acquisition (N. Ellis, 2002). Given the limited amount of time L2 learners spend in class, it is reasonable to conclude that explicit instruction is facilitative for SLA. Norris and Ortega (2000) conducted a meta-analysis on over two decades of empirical studies that investigated the effectiveness of implicit and explicit instruction in the field of SLA. The results demonstrated that explicit instruction was more effective than implicit instruction. Thus, Norris and Ortega concluded that explicit instruction for adult L2 learners was appropriate.

However, it is worth noting that the results favoring explicit instruction may be attributable to research bias. The majority of past experiments on L2 were designed to test explicit declarative knowledge (Doughty, 2003). Norris and Ortega pointed out that previous studies in laboratory settings were typically conducted within a short period of time. The average duration of instructional treatment was one to four hours. Such brief experiments automatically favor explicit treatment. It is unreasonable to expect that the effects of implicit learning would be observable during a short treatment period. Implicit

learning requires longer blocks of time because learners need a large sample in order to discover patterns (N. Ellis, 2005).

DeKeyser (2003) insists learners are more aware of underlying structure in input when they are explicitly provided with rules. His argument that explicit instruction is superior to implicit instruction in SLA stems from the results of studies comparing learners' performance under explicit instruction and implicit instruction in a laboratory context (DeKeyser, 1995; N. Ellis, 1993; Robinson, 1996). In these experiments, the group receiving the most explicit treatment outperformed the other treatment groups. DeKeyser argues that learning explicit rules makes it easier for learners to extend procedural knowledge. However, DeKeyser's claim is subject to the same criticism raised by Doughty (2003). The above mentioned studies were conducted within a short period of time. N. Ellis (2005) argues that explicit knowledge, namely metalinguistic information, provides learners with a priming effect: it allows learners to understand a specific context in which subsequent forms are used. DeKeyser also argues that explicit knowledge turns to implicit and automatized knowledge as L2 learners' linguistic ability develops, implying that the necessity of explicit instruction diminishes when their competence reaches a certain level. The period in which explicit instruction offers "priming effect" to L2 learners remains unclear.

Controversy Concerning the Effectiveness of Explicit Knowledge

Some scholars have raised questions as to the effectiveness of explicit instruction. Reber (1989) claims explicit instruction is facilitative only if given to learners prior to relevant input. Explicit instruction may cause interference effects if it is given to learners when they are exposed to input. According to Reber, explicit instruction not only interrupts learners' induction of rules from exemplars, but also induces learners to pick up inappropriate rules. Studies using artificial grammar (hereafter AG) revealed that AG

learners better acquired AG implicitly from exposure to instances than from explicitly explained rules (Mathews et al., 2000; Reber et al., 1980). These studies suggest that complex knowledge develops independently of conscious acquisition strategies.

Implicit learning allows for the induction of correct underlying structures that are intrinsic to the environment (Reber et al., 1980). VanPatten (2002, 2004) also disregards the need for explicit instruction. In his view, L2 learners' failure to comprehend input is due to ineffective processing strategies that originate in their L1. Therefore, instruction should focus on the correct decoding of L2. VanPatten claims that the Processing Instruction (hereafter PI), the teaching method he devised to facilitate L2-specific decoding strategies, is superior to other methods of instruction. He supported this claim through studies he and his colleagues conducted. For instance, VanPatten and Oikkenon (1996) examined the effectiveness of PI by comparing three instruction groups: an explicit information-only group, a structured input-only group (PI groups) and a group that both received explicit information about the linguistic form and engaged in structured input activities. The results showed that the explicit information-only group did not exhibit any gain.

These studies conducted by VanPatten and his colleagues were heavily criticized by DeKeyser et al. (2002), who voiced concerns about the design and the operationalization employed by VanPatten and his colleagues. According to DeKeyser et al., the participants who received PI in VanPatten and his associates' studies benefited from explicit instruction during the treatment. Thus, explicit instruction accounts for the gain participants demonstrated, and the effect of PI is obscure. The controversy between these research groups remains unresolved.

Effectiveness of Implicit and Explicit Knowledge by Task Type

In the previously mentioned experiments, the researchers designed their experiments to ensure that participants would use the specific knowledge type that the researchers believed to be more effective than the other knowledge type. However, the effectiveness of knowledge type may depend on the task, rather than any consistent superiority of one knowledge type to the other types in any given task. De Yong (2005) attempted to examine the knowledge type that could best facilitate comprehension and production. In his experiment, participants were divided into three separate groups according to treatment types: reception only (R), reception and production (R+P), and control. All training for treatment groups was conducted implicitly, while control groups received only explicit instruction. Results revealed that the R group processed target structures fastest, but they also made a relatively large number of errors in production. For the production task, the R+P group performed significantly more accurately in production than the R group. The control group performed better in the production task than R+P group. The results of this study suggest that implicit learning is effective for comprehension, but it does not necessarily lead to accurate production. DeKeyser's (1995) finding also confirms that production was facilitated by explicit knowledge given to learners. From the results of studies by De Yong and DeKeyer, it can be inferred that explicit knowledge promotes accurate production.

Time Constraints on the Use of Explicit Knowledge

Previous studies have shown that explicit knowledge is usable when learners are given time to plan and to make a judgment about accuracy (R. Ellis, 2005; Skehan, 1998, 2001). Explicit knowledge may be facilitative during an untimed production task, because learners are usually in control of their own speed of production. It is difficult to control the speed of others' speech and the often undesirable rapidity of speed to which

L2 learners are exposed imposes a heavy cognitive load on them. R. Ellis (2005) conducted a battery of tests to discover how L1 and L2 participants use each knowledge type according to task demands. His experiment consisted of timed and untimed grammaticality judgment, oral imitation, oral narrative and metalinguistic knowledge tests. The results revealed that the oral imitation task, oral narrative task and timed grammaticality judgment test (GJT) were heavily dependent on implicit knowledge, whereas an untimed GJT and a metalinguistic knowledge test were heavily dependent on explicit knowledge. The results suggest that L2 learners utilize both types of knowledge, but the type of knowledge used depends on the processing time available during a given task. Foster and Skehan (1996) investigated whether the availability of planning time would enhance L2 learners' production, and found that planning time resulted in greater accuracy. Even though Foster and Skehan did not probe whether L2 learners actually used explicit knowledge, it can be inferred that a planning opportunity allowed learners to retrieve explicit knowledge from memory. Ellis and Yuan (2003) also found that a planning time generated greater accuracy and complexity in L2 learners' oral production. These results are in line with De Yong (2005), suggesting that explicit knowledge facilitates accurate production. These results also indicate why L2 learners' performance declines when they lack sufficient time to access their declarative knowledge.

Automatization

Despite the ongoing debate over the effectiveness of explicit and implicit instruction, the importance of automatization is recognized by researchers and language instructors alike. However, as Segalowitz (2003) and DeKeyser (2001) point out, the definition of automatization varies from study to study. Most previous research characterizes automatization in terms of speed and accuracy, specifically swift, load-independent, effortless, and unconscious processing (Segalowitz, 2003). These characteristics are very similar to those of implicit processing; therefore, automaticity and

implicit processing are sometimes used synonymously in the literature. It is commonly recognized that learners achieve automatization through repeated practice (DeKeyser, 2001; MacWhinney, 2008; Newell, 1990; Segalowitz, 2003). However, repeated practice has been viewed negatively from a pedagogical standpoint because extensive repetition may create boredom and thus discourage learners' motivation (Segalowitz, 2003). Repeated practice should be accompanied by communicative value, for learners will not practice just for the sake of automatic processing.

One of the current controversies is the issue of knowledge interface. That is, whether or not explicitly acquired knowledge turns to implicit knowledge after repeated practice or vice versa. Dekeyser (2003) maintains a strong position in regard to knowledge interface. He argues that fully automated explicit knowledge is available during on-line tasks. Hulstijin (2002), Krashen (1981) and Paradis (1994) support a non-interface position, assuming that implicit and explicit L2 knowledge involve different acquisitional mechanisms. Under a non-interface position, explicit knowledge does not help learners process the L2 automatically. Scholars who embrace a weak interface position assume that explicit knowledge can be converted into implicit knowledge under certain conditions (Bialystok, 1982; N. Ellis, 2005; R. Ellis, 2005). R. Ellis (2005) in particular argues that the possibility of interface depends on learners' interlanguage status. In other words, explicit knowledge may turn to implicit knowledge if the learners are developmentally ready to acquire a certain L2 feature. Developmental readiness promotes learners' recognition of new linguistic elements in the L2 (Schmidt, 2001).

Summary of Explicit and Implicit Knowledge

Studies thus far have revealed that L2 learners use both implicit and explicit knowledge (Hulstijin, 2005) according to task demands (R. Ellis, 2005, Robinson 2005). According to Robinson (2003), implicit and explicit learning in adulthood are fundamentally similar, as both require focal attention and rehearsal of input in memory.

Intentionally focused attention may be practical for L2 learning, as input in L2 is infrequent and non-salient in most cases (Schmidt, 2001). Explicit knowledge enables L2 learners to select the target items from input; thus, it gives a priming effect for incoming input (N. Ellis, 2005). L2 learners perform better when they have adequate time to access explicit knowledge. Since the knowledge L2 learners gain stems mainly from explicit instruction in the classroom, L2 learners may need to rely on explicit knowledge to increase accuracy and complexity. If learners are able to depart from their heavy reliance on explicit knowledge, though, they may be able to perform accurately while producing complex structures regardless of time constraints or task type.

Since explicit knowledge and implicit knowledge contribute to different aspects of language learning, students who receive both explicit instruction and implicit exposure to a target language would achieve the best results (N. Ellis, 2002; MacWhinney, 1997). Regardless of explicit or implicit instruction, practice is of paramount importance for language acquisition (DeKeyser, 2003; N. Ellis, 2002). Practice aids L2 learners in making associations between forms and functions (N. Ellis, 2002).

Segmentation

In general, L1 speakers can understand the meaning of spoken words instantly without explicit knowledge. The ability to detect meaningful units in continuous speech is referred to as segmentation (Sanders et al., 2002). Segmentation is essentially boundary-finding in a continuous sound stream. To comprehend the meaning of a sound stream, a listener needs to find boundaries between words (Otake, 2006), clauses, and/or sentences. Semantic, prosodic, and syntactic information all contribute to the segmentation process (Sanders & Neville, 2000).

Development of L1 Children's Segmentation

Studies of L1 infants have shown that the variety of cues L1 infants use for segmentation increases as they grow. Newsome and Jusczyk (1995) found that L1

English infants first develop the ability to recognize word boundaries from stress patterns. Seven-and-a-half-month-old infants have not yet developed sensitivity to weak/strong patterns; thus, they incorrectly segment weak/strong words at the strong syllable boundary. As infants grow, they develop greater sensitivity to stress patterns, and they also start using distributional cues to determine boundaries between words.

L1 English infants start using syntactic cues after developing sensitivity to stress patterns. Shady (1996) investigated whether English L1 infants were able to discern meaningful sentences with the help of function words such as "the" and "is." She created two sets of passages; one consisted of natural sentences and the other of manipulated sentences. In the latter sentences, function words were inserted at wrong locations, such as "is bike with three wheels a coming down the street," instead of "a bike with three wheels is coming down the street." Children younger than 14 months did not show a preference for natural sentences, whereas 16-month-old children exhibited such a preference. Shady discovered that 16-month-old children were sensitive to the typical locations of function words. Jusczyk (2001) argues that such sensitivity allows infants to discover syntactic relations in fluent speech. At the initial stage, infants' ability to detect certain syntactic relations is limited to small units, but as they receive more input from their environment, they gradually learn to find longer meaningful sequences in fluent speech. Studies have found that some aspects of segmentation strategies are language specific: L1 speakers of French use syllables to detect a word (Mehler et al., 1981). Similarly, L1 speakers of English choose stress patterns and L1 speakers of Japanese use mora, respectively, to isolate a word in aural input (Cutler et al., 1986; Otake et al., 1993). Interestingly, L1 infants are able to discriminate consonants that do not exist in their L1 environment. For instance, Japanese infants are able to discriminate /l/ and /r/ at six to eight months of age, but infants 10-12 months old lose the ability to discriminate them (Tsushima et al., 1994; Kuhl et al., 1997). Cutler (2001) argues that infants' ability to discriminate sounds changes due to the semantic information of each lexical item. In

other words, infants' sensitivity to particular sounds disappears if sound differences do not contribute to the discrimination of words that carry different meanings.

L2 Specific Problems in Segmentation

In order to comprehend a second language spoken at a normal speed, L2 learners must be able to segment a sound stream into meaningful units. However, adult L2 learners do not possess the same sensitivity as L1 children do. Elementary level L2 learners have great difficulty determining boundaries between words and sentences in L2 speech (Jusczyk, 2001). Novice ESL learners' self-reports revealed that they could parse only the first few words (Goh, 2000). Some learners reported that they were unable to divide long sentences because sentences were spoken so rapidly that it sounded like all of the words were connected. Slightly more proficient ESL learners in Goh's study knew the meanings of individual words, yet processing the entire passage was still challenging for them. Studies have indicated that language-specific segmentation causes problems when novice L2 learners hear input in the L2. L2 listeners tend to apply the segmentation strategies of their L1 to the L2 input (Cutler, 2001; Otake, 2006). For instance, neither L1 English listeners nor L1 French listeners adopt mora-based segmentation of Japanese input (Otake et al., 1993). Japanese listeners do not employ syllabic segmentation with French input (Otake et al., 1996). Therefore, L2 listeners are prone to erroneous segmentation.

Furthermore, L2 learners' use of acoustic cues is less effective in terms of both variety and accuracy. Altenberg (2005) investigated intermediate-level ESL 1earners' ability to use English acoustic-phonetic cues to segment a stream of speech into words. Stimuli were presented to learners in three different conditions: presence or absence of aspiration, presence or absence of glottal stop (e.g. *like old*) and presence of both aspiration and glottal stop. Given the fact that Spanish has no aspirated consonants and the L2 learners of the study were all L1 Spanish speakers, it was hypothesized that

aspiration would not provide an effective cue for the L2 learners. The results revealed that L1 learners performed significantly better than L2 learners for all conditions. L2 learners' segmentation was significantly better in the two conditions in which a glottal stop was involved than in the condition in which aspiration was the only available cue. The idea of language-specific segmentation was thus confirmed.

Development of L2 Learners' Segmentation

Despite L2 learners' lack of sensitivity to L2 specific sounds, L2 learners develop the ability for segmentation because they are capable of utilizing other available cues. According to the meta-analysis of L2 listening processing by Johnston and Doughty (2007), proficient listeners use a variety of acoustic and syntactic cues for segmentation. On the other hand, low proficiency L2 listeners' use of cues is limited in the initial stage of acquisition, and they must rely on acoustic and semantic cues. Sanders et al. (2002) conducted experiments examining ESL learners' and monolinguals' use of semantic and syntactic segmentation cues in English. L2 learners and monolinguals consisted of L1 Spanish and L1 Japanese speakers, and their respective performances were compared to those of L1 English speakers. In the experiment, participants were given lexical, syntactic (morphemes), and stress-pattern information, and were asked to determine whether specific sounds fell at the beginning or in the middle of words in English sentences. Both L1 English speakers and ESL learners performed better within semantic than within syntactic sentences. However, L2 groups did not use syntactic information as a segmentation cue to the same extent as L1 speakers. Nevertheless, L2 learner groups employed a greater variety of cues than monolinguals. L2 learner groups relied on stress pattern as a segmentation cue in the absence of lexical and semantic information. The authors concluded that adult L2 learners were flexible enough to deal with the absence of a particular cue. L2 learners' ability to make use of different cues improves as they continue to learn the L2.

Johnston and Doughty (2007) suggest that L2 learners' ability to utilize cues develops on a continuum. In their scale, the ability to utilize syntactic cues is located at the end of the continuum. However, it is worth noting that not all syntactic cues pose equal difficulties for L2 learners. L2 learners do not easily recognize global cues such as long-distance agreement, but local cues such as case marking prove more easily recognizable for them (Miyake & Friedman, 1998). Koda (1993) investigated novice L2 Japanese learners' use of case-marking. Participants consisted of L1 Chinese, English and Korean students. The subjects were asked to listen to the sentences in canonical and non-canonical order and to select the word that functioned as an agent. The results revealed that the subjects performed better when case-marking particles were available regardless of their L1 or the word order, which suggests the possibility that there are different levels of reliability among syntactic cues: Particles are reliable in Japanese and thus are available to elementary level learners.

In conclusion, L2 learners' processing remains ineffective until they acquire the capability of using various syntactic cues. Ineffective segmentation, in turn, leads to a lack of automaticity. After developing sensitivity to multiple cues, L2 learners are able to control processing space and to invest attention in less salient yet important elements of input.

Treatments for Successful L2 Segmentation

Doughty (2003) suggests that L2 learners should be trained to find reliable cues in input so that they can process sentences effectively. Since novice L2 learners are not adept at using appropriate L2 parsers for sentence processing, they may benefit from instruction treating L2-specific problems. In the field of SLA, Processing Instruction (PI) by VanPatten (2002, 2004) is widely recognized as a method for promoting correct L2 processing. PI is based on the assumption that learners' working memory is limited, so they process input for meaning before they process it for form (Van Patten, 2002, 2004).

PI intends to discourage erroneous processing strategies by L1 English learners of Spanish, such as assigning the role of agent (or subject) to the first noun they encounter in a sentence. In order to help learners process input correctly, PI adopts an input enhancement technique, in addition to lectures about linguistic forms and incorrect processing strategies by L2 listeners. The effectiveness of PI has also been extensively examined in other studies. These studies, which examine different languages and learners at different proficiency level, have not proven the effectiveness of PI (DeKeyser et al., 2002). PI may be effective for novice learners of Spanish whose L1 is English, but PI's applicability beyond novice-level L2 learners is still uncertain.

Processing Instruction concerns segmentation only within a simple sentence. Obviously, L2 learners must also be able to segment embedded clauses, complex sentences and paragraphs to enhance their L2 competence. Therefore, the promotion of L2 learners' segmentation beyond the sentence level is a theoretical and pedagogical issue. In the realm of SLA, the possibility of increasing L2 learners' comprehension by manipulating input has been widely discussed and examined. Blau (1990) examined the effect of pauses and reduced speed of input, assuming that these manipulations would increase the comprehensibility of input for college-level ESL learners. Since pauses and reduced speed were applicable to the entire passage, such manipulations could promote learners' listening comprehension beyond the sentence-level. Participants were assigned to three groups, and each group listened to the same passage recorded at either normal speed, reduced speed, or with pauses. It was found that learners comprehended the monologues significantly better in the version with pauses than in those recorded at reduced speed or at normal speed. The effect of pauses on listening comprehension was also examined by Harley (2000). L2 English learners' listening comprehension was more successful when learners' attention was drawn to pause-bounded units rather than to syntactic cues.

It is worth noting that pauses are effective only under certain conditions. Blau (1990) discovered that the effect of pauses differed depending on learners' proficiency levels. Lower proficiency learners benefited from pauses more than higher proficiency learners did. The results suggest that the effect of a pause disappears if a learner's proficiency level is high enough to process aural input at natural speed. Leeser (2004) examined the influence of pauses and familiarity on L2 listening comprehension and the learning of a novel structure. He chose the third-person future tense morphology in Spanish as the target form, which is perceptually salient both in the written and the aural modes. At the time of the study, participants who were enrolled in elementary Spanish at a university had not learned Spanish future tense morphology. Participants were assigned to different treatment groups, and each group listened to a passage. The passages were controlled in terms of the familiarity of the topic and presence of pauses. Learners' acquisition of the new form was probed though the accuracy rate of form-recognition tasks and tense-identification tasks. Learners' comprehension of future actions from the passage was evaluated according to the accuracy of free recall and a multiple-choice test based on the passage. The study found that pauses were not always effective, and they actually lowered learners' performance accuracy in the familiar topic condition. Learners who heard unfamiliar passages with pauses recalled more than those who heard the version of the passages without pauses. No difference was found between pause and without-pause conditions in the performance of the tense-identification and form recognition tasks. A perceptually salient form was chosen in this experiment, so that pauses did not produce a significant impact on the recognition of the target form. In sum, pauses are effective under unfamiliar or non-salient conditions, and the benefit of pauses diminishes as L2 learners' proficiency reaches a certain level.

Johnston and Doughty (2007) indicate that using syntactic cues, especially morphemes, is the most difficult skill for L2 learners to obtain. Recognition of morphemes seems essential for overcoming the difficulty of segmentation. The literature

suggests that low salience accounts for the difficulty of processing morphemes (Bates & Goodman, 1997; N. Ellis, 2008; Slobin, 1985). It has been argued that L2-specific problems can be solved by raising learners' awareness (Doughty, 2003; Schmidt, 1990; 2001, Slobin, 1993). Whether or not L2 learners are able to recognize low-salient cues by raising their level of awareness has been extensively argued. The role of awareness and attention will be discussed in the following section.

Awareness and Attention

In this section, the role of awareness and attention to SLA is discussed in relation to the Noticing Hypothesis (Schmidt 1990, 2001). Schmidt (1990) identified some factors that influence learners' awareness. Such factors included frequency of a particular item in the input, the perceptual salience of a particular form, the current stage of learners' interlanguage system and task demands. This section mainly discusses how these factors apply to L2 learners' sentence processing from aural input.

The Noticing Hypothesis

The Noticing Hypothesis proposed by Schmidt (1990, 2001) claims that only the items learners pay attention to are internalized in their language system. The main assumption of this argument is that L2 learners' intake will be enhanced if their attention can be drawn to appropriate parts of the input. Part of the evidence Schmidt drew on to support his hypothesis was his own experience learning Portuguese in Brazil. Schmidt and Frota (1986) found that production of a particular form emerged after Schmidt recognized it in the input he received. He discovered a case in which he had not produced particular verbs despite the fact that the verbs had been present in his comprehensible input for five months. Only after these verbs were brought to his attention did Schmidt finally start using them. Since the Noticing Hypothesis was introduced, SLA researchers have actively discussed how to raise awareness. Despite general acceptance of the

hypothesis in the field, whether implicit learning requires attention is still inconclusive from a cognitive psycholinguistic view point (Hulstijn, 2005).

Controversies About Learning Without Attention

The Noticing Hypothesis has provoked some criticisms since it was introduced. In the discussion of the hypothesis, Tomlin and Villa (1994) pointed out that the definition of noticing was too coarse and should be more granulated. They suggest that a distinction needs to be made between non-conscious registration and detection within selective attention. Tomlin and Villa discuss non-conscious registration through observations of L1 acquisition. Despite the fact that infants do not consciously select certain forms for the purpose of acquisition, they acquire their L1 successfully after being exposed to an enormous amount of input. Schmidt (2001) acknowledged the criticisms raised by Tomlin and Villa by admitting that learning can take place without attention if learners are exposed to a large amount of input.

The learning environment of L2 learners is very different from that of L1 children. Most adult learners are exposed to L2 mainly during classroom periods. This is precisely why raising awareness is considered extremely important for L2 learning within a limited time frame. The next question arises as to whether it is possible to learn a new L2 structure by receiving large amounts of input in short durations without explicit instruction regarding a structure. Studies in a laboratory setting (Ellis & Sinclair, 1996; Ellis & Schmidt, 1997) found that a particular linguistic element can be learned after heavy exposure even if learners' attention was not brought to that particular element. These studies suggest that L2 learners possess the ability to detect specific information from input without awareness, which is in line with the argument raised by Tomlin and Villa (1994).

A Factor That May Contribute to Awareness: Frequency

Scholars who support a usage-based approach recognize that frequency affects the acquisition of language (Bybee, 1985, 2008; Langacker, 1987) regardless of L1 or L2 (N. Ellis, 2002, 2008; Lieven & Tomasello, 2008). In the study of L1 acquisition, Lieven and Tomasello discovered a correlation between the order of emergence of verbs and the frequency of those verbs addressed to children. In SLA, studies conducted in a controlled environment (Ellis & Sinclair, 1996; Ellis & Schmidt, 1997) and in a natural language learning setting (Schmidt & Frota, 1986) both demonstrated that frequency plays an important role in acquisition. According to N. Ellis (2002), multiple instances are stored in learners' memory after frequent exposure. Those multiple instances enable learners to figure out functions of linguistic elements. Less frequent constructions are more difficult for learners to grasp because they have not processed enough instances to predict the function of such constructions.

Under the usage-based model, frequency of input determines the acquisition order of morphology for both L1 and L2 learners (Bybee, 2008). Learners learn high-frequent morphology first and later learn low-frequent morphology based on their analysis of high-frequency. To understand how frequency impacts the acquisition of morphemes, it is necessary to understand the distinction between type-frequency and token-frequency. According to Lieven and Tomasello (2008), type-frequency refers to the frequency with which particular items appear in input, while token-frequency refers to the frequency of different forms in which many different words can be substituted. The English past tense marker *-ed* is an example of token-frequency. N. Ellis (2008) contends that type-frequency contributes to productivity because it allows learners to generalize about how certain forms are used at a particular location by hearing many instances.

The effect of input frequency on the acquisition of L2 grammar has been examined both in laboratory and classroom settings. Ellis and Schmidt (1997) tested the

effect of frequency for acquisition of morphology in a laboratory setting. They adopted an artificial language to eliminate the influence of learners' previous exposure to forms. The target items included regular and irregular plural forms. During the plural-learning phases, verbs were presented in a block at different frequency: half of them once, and the other half of them five times. The learning phase continued for several blocks (ranges from zero to nine blocks) until learners were able to respond verbally within two seconds of stimulus onset. The results revealed a significant effect of input frequency and form regularity, and the frequency effect was larger for the irregular items. A significant interaction of regularity, frequency and block was also found. Ellis and Schmidt argued that learners' significant improvement over blocks suggests that acquisition of L2 morphology improves with practice.

Trahey and White (1993) investigated frequency effect of input in an immersion program. The focus of the study was to examine whether fifth grade L1 French children would acquire better knowledge of correct adverb placement in English from large amounts of exposure to correct usage, and they named the treatment "input flood". The input flood lasted for two weeks. L2 learners were not encouraged to produce during the period, as the main purpose of the study was to see the effect of input. The result revealed that children learned that an unacceptable position of adverb in French was acceptable in English, but they continued to accept an ungrammatical position of adverbs in English that was acceptable in French. In sum, L2 learners did not come to realize what was unacceptable in the target language. The results of Trahey and White indicate the difficulty of learning L2 features solely from a large amount of exposure, particularly if the item's feature is not salient enough to notice (DeKeyser, 2003).

To date, the effectiveness of input frequency for the acquisition of L2 features is not as obvious as for L1 acquisition. Generally, L2 learners are not exposed to features of a target language as much as L1 children are (Bybee, 2008). This explains the slow nature of implicit learning (N. Ellis 2005).

A Factor That May Contribute to Awareness: Perceptual Salience

Goldschneider and DeKeyser (2001) investigated factors that explain English L2 learners' acquisition order. Perceptual salience was found to possess the highest predictive power among other possible factors. Other factors included semantic complexity, morphophonological regularity, syntactic category, and frequency. According to N. Ellis (2008), salience refers to the perceived strength of stimuli. The basic assumption is that the more salient a cue is in a target language, the more likely learners will be to recognize it, thus allowing learners to focus on the cue. Therefore, learners may not perceive a feature that is not salient in input. Morphology offers such an example. Children have difficulty in acquiring morphemes that are bound, unstressed, contracted, asyllabic or varying in form (Slobin, 1985). In natural speech, bound-morphemes are often fused with surrounding elements so that boundaries between morphemes and words become vague (N. Ellis, 2008). Bound inflections are short and unstressed even in slow speech (Bates & Goodman, 1997). Considering the lack of perceptual salience, acquisition of morphemes is particularly challenging for L2 learners. The difficulty of acquiring L2 inflection and morphology has been documented in many studies (e.g. R. Ellis et al., 2005; Lardiere, 1998).

A Factor That May Contribute to Awareness: The Current Stage of Learners' Interlanguage System

It has been argued that L2 learners' interlanguage level at a given time determines whether learners are capable of noting a particular L2 feature (Leow, 1998; Schmidt, 1990). Therefore, learners probably do not recognize a feature that is too advanced for them. The notion that L2 learners' current stage of interlanguage system places constraints on learning was put forth by Pienemann (2003), who argues L2 learners' grammatical competence develops in a language-specific sequence. His Processing

Theory predicts that L2 learners' processing capacity limits their ability in production because they are unable to process structures they have not acquired. Mackey et al. (2002) and Philip (2003) both found that L2 learners noticed less when the feedback given to them was less relevant to their level of interlanguage grammar. These studies indicate that there is a link between noticing and learners' interlanguage, and an item that is too advanced for learners is less likely to be processed.

A Factor That May Contribute to Awareness: Task Demands

Schmidt (1990) contends that appropriate tasks invoke learners' awareness; thus, learners process relevant information regardless of their intention to learn. Robinson (2001) also argues that appropriate task facilitates L2 learning. He investigated whether task difficulty affected Japanese learners' production in English. L2 learners' production was assessed for accuracy, fluency and complexity. The results revealed that a simpler task led to a greater variety of lexical items and increased fluency, whereas a complex task facilitated more interactions between pairs, particularly in the form of confirmation checks. Interestingly, task complexity did not significantly affect speakers' accuracy. Their accuracy improved, though not in a statistically significant way, when they were engaged in a complex task. Robinson argues that increasing the cognitive demands of tasks increases cognitive resources, leading to more attention to target features and incorporation of those features in working memory. Furthermore, he stipulates that increased cognitive demands facilitate learners' noticing and lead to greater modification of output. From Robinson's perspective, the ideal pedagogical task for L2 learners should be challenging enough to invoke learners' attention to relative input, yet relevant to learners' current level of proficiency so that a task is manageable for them.

Working Memory

Is Working Memory Capacity Limited?

Learners' WM capacity has been widely discussed in relation to their level of awareness. It has been considered that each individual is different in their ability to pay attention and to remember what they have learned, and the difference accounts for his or her success in language acquisition (N. Ellis, 2001). One of the well recognized WM models in the field of cognitive science and psychology was constructed by Baddeley and Hitch (1974). The model consisted of the central executive system and modality-dependent peripheral systems. Under the model, the central executive system deals with complex cognitive operations, and the processing of auditory or visual information is conducted in the modality-dependent systems. Baddeley and Hitch hypothesized that each individual's limited WM capacity causes trade-off problems during a concurrent dual task. In their experiment, they found that participants' performance on reasoning slowed down when they shifted attention to a more complex memory task. The model presupposes that high cognitive demand in central executive system affects learners' processing of visual or auditory information.

In the realm of SLA, it has been argued that L2 learners' limited WM capacity creates difficulties learning a novel L2 feature (N. Ellis, 2001; Schmidt, 2001; Skehan, 1998; VanPatten 2002, 2004). That is, individuals' WM capacity constrains their ability to acquire a linguistic item. According to Baddeley et al. (1998), WM capacity is determined by stored knowledge. Since novice L2 learners do not possess much knowledge concerning their L2 in comparison with more proficient learners, it is highly likely that the L2 input novice learners receive exceeds their WM capacity. Thus, there is little room for absorbing new input. Under this assumption, a proficient learner is one with a large WM capacity who has better attentional resources. VanPatten's solution for dealing with limited attentional capacity is guiding L2 learners to use correct processing strategies specific to a target language. From Skehan's point of view, L2 learners' limited attentional capacity causes disfluency, inaccuracy and lack of complexity during a task. He proposes to resolve these problems by providing learners with a planning phase prior to their task engagement. Given the importance of WM in SLA, the reduction of cognitive load is a feasible solution that emerges across studies. The following section focuses on studies that have investigated the influence of WM capacity and the effective use of WM on L2 learners' performance on various listening tasks.

Effect of Working Memory Capacity on Sentence Processing

Under the assumption that learners who are endowed with a large WM have a better ability to store and process linguistic information, various studies have employed a repetition task (e.g. Erlam, 2006; Gallimore & Tharp, 1981; Graham et al., 2008; Hameyer, 1980; Kurata, 2007). In these studies, participants were given lists of different words or sentences and asked to repeat as many as they could. These studies assumed that high proficiency learners are able to hold and process much information; therefore, their repetition is more accurate than those with small WM capacity. To verify the contribution

of WM capacity to sentence repetition, some studies also adopted memory tasks, such as a story retelling task (Erlam, 2006) and a listening span test (Kurata, 2007).

Studies have suggested that any person can recall anything that can be said within approximately three seconds (Cowan, 1993). If this is true, individual difference will be revealed after more than three seconds of input is given: what a learner can recall after three seconds is their knowledge stored in memory. Kurata (2007) investigated how WM capacity and different repetition conditions would influence advanced L2 Japanese learners' comprehension of the meaning. She used repetition conditions of simultaneous shadowing, delayed shadowing and repetition. Shadowing is a linguistic task in which learners are required to listen and repeat stimulus simultaneously, and it is believed to enhance learners' phonological processing (Tamai, 2002). In the delayed-shadowing condition, learners were instructed to start repeating when they heard the second word of a stimulus. In the repetition condition, learners began repeating immediately after a stimulus. After engaging in each task, learners saw sentences on a computer screen and were asked to indicate if they thought a sentence on the screen was one of the sentences they heard during the shadowing and repetition tasks. A listening span task was also given to learners to examine their WM capacity. The results revealed that learners' recognition of the sentences was worst under the simultaneous shadowing condition, and the low WM capacity group suffered more from the lack of duration between hearing and repeating stimuli than the high WM group. These results suggest that even advanced-level L2 learners' comprehension would be affected if they were not given time to think about the meaning before repetition. As Tamai (2002) argues, shadowing may promote phonological-level encoding, but did not facilitate higher level processing including lexical-level encoding.

Miyake and Friedman (1998) discussed the effect of WM capacity to account for the similarity of L2 learners' and L1 speakers' cue preferences in syntactic comprehension. They analyzed the performance of native speakers of Japanese studying

English as L2. The learners engaged in listening span tasks, a syntactic comprehension test and an agent identification task, and the study examined correlations among L1 WM, L2 WM, syntactic comprehension and cue preference. Results showed that all variables were correlated, and learners with high L2 WM demonstrated similar cue preference to L1 speakers. These results were consistent with the results of L2 segmentation studies reviewed by Johnston and Doughty (2007); that is, high proficiency learners are able to use cues that are similar to those used by L1 speakers. Miyake and Friedman (1998) argue that high WM capacity learners are endowed with the ability to retain information they have heard while processing novel input specific to L2.

Memory and Semantic Support

McDade et al. (1982) found that children were able to repeat a sentence without understanding its meaning immediately after input. In their study, children's understanding was probed by asking them to select a corresponding picture in a multiple choice format. Children were able to repeat stimuli significantly better when they exhibited understanding of the meaning even after a delay was imposed. However, when a pause was imposed, the children's ability to repeat sentences they did not understand deteriorated significantly. It is the meaning attached to a sentence that prevents learners from experiencing memory decay. Understanding the meaning of a sentence helps learners to reconstruct it, but physical sounds do not help them reconstruct it to the same extent as meaning does.

Miller (1958) was a pioneer who investigated the role of WM in the accuracy of repetition, offering empirical evidence that semantic information supported the retention of given input in memory. In his experiment, participants' recall of sentences was better than that of random items because a sentence consists of individual words forming a meaningful chunk. Chunks remain in memory while bits of unrelated information fade away almost instantly. The contribution of semantic information to the recollection of L1

and L2 words were investigated by Hulme et al. (1991). In their experiment, L1 English adults engaged in repetition tasks. Participants repeated lists of non-words and real words of different lengths that were spoken at different speech rates. The researchers increased the length of lists as accuracy of repetition also increased. Results showed that real words were recalled with significantly more accuracy than non-words, regardless of length or speed. The authors also tested learners' memory span on unfamiliar words in Italian and the English equivalent of the Italian words at different syllable length. As expected, learners' memory span for English words was significantly longer, and that for Italian words improved significantly after learners were asked to memorize the words' meanings. Participants' performance improved significantly more for longer words than for shorter words.

The importance of knowing the meaning of input for recall has emerged across empirical studies. According to Bates and MacWhinney (1987), lexical items provide cues to functional interpretation for sentence comprehension or production, suggesting that understanding of sentences is built on the knowledge of lexical items. If learners do not know the meaning of lexical items, interpretation of the function of structures is difficult.

Dual-Modality Support

Some researchers in the field of educational psychology have investigated the effect of dual-modality support. Their basic claim is that working memory capacity is enhanced by providing dual-modality support (Mayer, 2001; Mousavi et al., 1995; Penney, 1989). Typically, dual-modality support is provided in the form of visual and auditory supports. Mousavi et al. (1995) conducted experiments to verify the effect of dual-modality instruction on high school students' geometry learning. They compared the time learners spent solving problems in different instructional conditions. Participants were divided into visual-visual groups and visual-auditory groups. Within the same

instructional conditions, students were further divided by simultaneous or sequential presentation conditions. As the researchers expected, dual modality groups solved problems significantly faster than single modality groups. The effectiveness of dual-modality on linguistic performance was demonstrated by Martin (1980). In Martin's experiment, words in different categories were presented with three different supporting conditions: auditory, visual, and a combination of audio and visual support. Results confirmed the enhancement of learners' recall by dual modality. When participants were asked to recall the specified category of words, participants in the dual modality presentation group demonstrated significantly better recall than those in either single modality presentation group. Frick (1984) tested the effectiveness of dual modality on the recall of digits, and the results also confirmed the effect of dual modality. This effectiveness applies to items like digits that do not carry semantic information.

Thus far, the effectiveness of providing multiple attentional resources has been confirmed. However, it is worth mentioning that the effect of dual modality diminishes when learners are able to anticipate the input that will follow. In the experiment by Martin, no difference was observed between single supporting and dual supporting conditions when participants were given information about the category of words prior to receiving input. Prior knowledge is probably a factor that affects the effectiveness of dual modality. This is worth further investigating for pedagogical purposes. Specific conditions that enhance learners' accuracy of recall need to be explored to better understand the effectiveness of dual modalities.

Chunking

As mentioned in chapter I, a classic study by Miller (1956) proposed that chunking enables the reduction of cognitive load and results in better recollection of input. It has been argued that chunking also leads to productivity (N. Ellis, 2001; 2003; MacWhinney, 2008). Some researchers consider that repetition of chunks contributes to

the retention of a form in memory (Bybee, 2008; N. Ellis, 2002, 2003; Millar, 1956). Stored chunks are later going to be consolidated to longer chunks (N. Ellis, 2005; Newell, 1990). According to MacWhinney, chunks are not the product of memorized grammar rules; rather, they emerge from a large amount of exposure. With increased exposure to L2, learners are able to process sentences more automatically and efficiently (N. Ellis, 2003; MacWhinney, 2008).

Repetition of a new linguistic item may be an effective way to increase the amount of exposure to the target item. The effect of repetition for better memory storage is known as the Hebb effect (N. Ellis, 2003; Lewandowsky & Murdock, 1989). N. Ellis and Sinclair (1996) provided empirical evidence that supported the Hebb effect on L2 grammar learning. In their experiment, short-term acquisition of Welsh was tested in three different learning conditions. During the treatment phase, participants learned two structures, "where is X" and "his X". The latter structure, which involves soft mutation was considered to be difficult for L2 learners to grasp, given the fact that the description of Welsh soft mutation was quite complicated. Participants in the silent condition group just listened to utterances silently. The repetition group was asked to repeat aloud when they heard Welsh utterances. Participants in the articulatory suppression condition group were asked to count from one to five while listening to the utterances. All participants engaged in various immediate post-tests, and their performance was examined in terms of accuracy. The results revealed that the repetition group outperformed other groups on the translation task, the explicit rule test, and the speech production task. The grammaticality judgment test was the only item in which the effect of repetition was not observed. This experiment demonstrated the possible contribution of chunk repetition to short-term learning. However, there are many aspects that are unsolved in this experiment. No delayed post test was adopted, so how long the effect of repetition may last is uncertain. Additionally, learners were exposed to only two structures during the learning phase. The effect of repetition might be different if learners were exposed to a variety of structures.

A more complete study involving multiple structures revealed that the effect of chunking was rather marginal. Robinson (2005) investigated the acquisition of artificial grammar and L2 Samoan. The experiment consisted of a Samoan vocabulary-learning phase followed by two training sessions, an immediate post test and two delayed post tests. During the Samoan training session, learners viewed three types of sentences consisting of an ergative maker, a locative marker and a direct object noun marker. In the testing phase, learners responded to yes-no questions related to each sentence. Strength of chunks was measured in terms of the numbers of chunks included in a sentence and a raw frequency of chunks that appeared during the tests. The results revealed that chunk-strength negatively influenced the judgments of ungrammatical items of both artificial grammar and Samoan. Raw frequency of chunks during the training sessions did not contribute to the participants' correct grammatical judgment. The positive influence of chunks was found only in grammatical Samoan sentences. The sentences containing more chunks used in the training session contributed more to the correct grammatical judgment test than the sentences containing less chunks did.

N. Ellis (2005) points out that chunking does not work for the acquisition of complex items, such as long-distance dependencies. In essence, chunking is a form of implicit learning. It takes a long time until the effect of chunking emerges. Therefore, observing the effect of chunking during a short term language acquisition experiment is highly unlikely. It is reasonable to conclude that chunking can enhance automaticity if learners are exposed to items for a long period. Chunking does not promote the acquisition of a complex system, especially within a short period of time.

Complexity

The effect of sentence complexity to sentence processing involves various complex issues, and the mechanism which may affect sentence processing is still under debate. It is fair to assume that sentence complexity will play a major role for the

accurate processing and recollection of sentences. The relative importance of complexity and sentence length for recall was investigated by Roberts and Gibson (2002). They hypothesized that clauses were the units of segmentation during speech perception; therefore, the accuracy of parsing is not affected by the number of words in a sentence. They assessed adult L1 English speakers' sentence memory using three different sentence types. Relative clause, sentential complement (*that* clauses) and relative clause with double objects were used as stimuli. After hearing stimuli, participants were asked to answer the agent and the action taking place in each clause (e.g. What did X do?), but the final clause was excluded from questions because it was semantically constrained. Participants' performance was evaluated in terms of accuracy. The researchers' main interest was whether double object sentences were more difficult to comprehend compared to other, shorter sentence types. If the number of NPs was sensitive to sentence memory, participants' performance should have declined when they heard sentences with double objects. A double object sentence had an additional NP or PP; thus, it was longer than the other two types. There was no significant difference among three sentence types. Accuracy of all sentence types declined as the number of clauses increased. Roberts and Gibson concluded that English L1 speakers' sentence memory was influenced by the number of clauses in a sentence, not the number of NPs or discourse referents. The results of Roberts and Gibson lend support to the argument that the structure of a sentence influences WM more than the length of a sentence does, which agrees with Miller and Chapman (1975), who found that the number of morphemes, not the number of words, influenced L1 children's repetition of sentences.

However, there is an argument that appears to contradict the results of the studies mentioned above. In the review of studies concerning WM and sentence comprehension, Caplan and Waters (1999) argue that sentence complexity does not reveal L1 speakers' individual differences in WM capacity. They contend that low WM capacity individuals have difficulties retaining information about the actor in each proposition; so it is the

number of propositions that affects sentence comprehension. To date, how sentence complexity and sentence length respectively affect WM remains unclear. The impact of sentence complexity to L2 processing has not been explored yet.

L1 Acquisition of Morphemes

A study concerning L1 children's acquisition of verb morphology found that WM capacity influenced the acquisition of morphology. McDonald (2008) compared L1 children's performance and L1 adults' performance on various grammatical tasks. Participants engaged in a grammaticality judgment task including third person agreement, irregular forms for plurals and past tense. Participants were also tested on WM span and phonological ability. The study demonstrated that children's morphology errors involving regular verbs were affected by WM capacity. Also, children's performance on constructions including the omission of function words and lower phonetic substance morphemes were affected by their phonological ability. An L1 English children's sentence memory study by Miller and Chapman (1975) showed that the number of morphemes included in their stimuli (third person singular s, plural s and past tense *-ed*) significantly correlated with the sentence difficulty. The number of words in the stimuli did not account for the difficulty of repetition. It can be inferred that the processing of morphemes is demanding even for L1 children.

L2 Acquisition of Morphemes

Given the results of studies that examined L1 children's processing, it is highly probable that morphemes place high cognitive demands on L2 learners as well. Studies have shown that L2 learners have great difficulty processing morphemes from a sound stream. R. Ellis et al. (2005) demonstrated that L2 learners of English were unable to repeat the English past tense marker *–ed* from aural input despite explicit knowledge they demonstrated during a grammaticality judgment task.

The difficulty of morpheme acquisition may be explained by the distance between a morpheme and a relevant syntactic element that must agree with it. If the two elements are separated by other syntactic elements, making an association between them while processing other elements imposes a heavy cognitive load. To examine how WM affects the generalization of long distance agreement rules, Ellis and Schmidt (1997) ran an experiment using artificial language. In their study, learners' short-term memory (STM) and long-term memory (LTM) were examined. The target items included two adjacent agreement rules and one long distance agreement rule. As a measure of STM, participants were shown a sentence on a screen for two second, and asked to type the sentence after it disappeared from the screen. As a measure of LTM, participants were asked to type any sentences they could remember after the completion of the STM task. After these tasks, a grammaticality judgment task was given to participants to gauge their acquisition of agreement in the artificial language. Participants' performance on STM and LTM measures was highly and significantly related. Neither STM nor LTM predicted the accuracy of local dependencies in the grammaticality judgment task, but both of them predicted the accuracy of a distant agreement rule. The results clearly demonstrated how WM contributes to the acquisition of morphology that requires agreement, especially, long distance agreement.

Under-Investigated Areas of WM in L2 Learning

Research has shown the significant contribution of WM to language acquisition. However, more needs to be explored to understand how effective use of WM might facilitate L2 segmentation. If the difficulty of morpheme processing is attributable to heavy cognitive demands, this can be treated by reducing cognitive load. In their review of L2 learners' cue preferences, Miyake and Friedman (1998) argue that global cues, such as agreement and word order, demand a high memory load, because a learner must retain the initial syntactic information in memory while analyzing the rest of the syntactic

information to understand the entire sentence. In contrast, local cues such as animacy or case marking can be processed without considering other words in a sentence or other phrases in a clause. If the processing of local cues can be carried out separately from other syntactic elements, local cues such as particles do not pose heavy cognitive demands. Furthermore, processing particles may not be enhanced by reducing cognitive demands, because the difficulty of processing particles is not always associated with distant agreement. The study by Koda (1993) offers evidence that particles do not pose high processing demands. In her study, elementary level L2 learners of Japanese, regardless of their L1, were able to use particles to comprehend sentences. To verify the possibility that effectiveness of cognitive load reduction depends on syntactic elements, L2 learners' processing of various sets of syntactic elements need to be examined.

Interaction between WM and proficiency is another area that remains unexplored. N. Ellis (2001) contends proficient learners are capable of making associations between visual and phonological representations. If this holds true, low WM capacity individuals who need additional cognitive support would benefit from dual-modality instruction more than high WM capacity individuals do. This interaction issue also needs to be investigated to understand the role of WM for SLA.

Elicited Imitation

Overview

The contribution of WM to language development has been tested by various methods. Elicited Imitation (hereafter EI) is one common technique used to measure linguistic competence. As mentioned in chapter I, EI has been widely used to examine the linguistic abilities of both L1 children (e.g. Gallimore & Tharp, 1981; McDade, 1982, Miller & Chapman, 1975) and adult L2 learners (e.g. Erlam, 2006; Henning, 1983; Spitze & Fischer, 1981). During EI, learners are asked to repeat a given sentence as accurately as possible. Simply put, EI is a memory task: learners must remember in detail what they

have just heard in order to repeat the entire sentence accurately. Each individual has a different WM capacity, and the difference in capacity explain the individual differences in language aptitude (N. Ellis, 2001).

EI as a Valid Testing Instrument

There is much empirical evidence indicating that EI is a reliable tool to measure linguistic competence based on its high correlations with other tests. For instance, studies that dealt with ESL learners' performance found that EI correlated well (r =.658) with ESL learners' performance on the Oral Proficiency Interview (Graham et al., 2008) and standardized English tests such as the International English Language Testing System (IELTS) (Erlam, 2006). Among the subcomponents of IELTS, correlation between EI was highest on listening (r =.72) followed by speaking (r =.67). Interestingly, Erlam found that the correlations between EI and all components of IETLS including writing and reading sections turned out to be r = .76, which was a higher correlation than the listening section alone. Henning (1983) found that EI exhibited high validity as a testing instrument. He compared ESL learners' performance on EI, sentence completion and an oral interview. The EI task adopted sentences of varying length and the intonation pattern of words; thus, the task was considered to have high discriminative power. In the sentence completion task, participants heard the first two to three words of a sentence and created a complete sentence following the words they heard. Participants' performance was evaluated in terms of grammatical accuracy, fluency and pronunciation. The results indicated that EI was superior to other oral skill testing methodologies for reliability and validity, exhibiting better discriminatory power.

Studies about child language development found high test-retest correlation in EI (Gallimore & Tharp, 1981). In their study, they administered EI periodically for over four years, and it successfully captured children's constant improvement on the task. Thus far, EI-related studies have predominantly examined ESL learners' and L1 English children's

performances. Studies of L2 learners other than English learners are still marginal. No studies have examined the performance of L2 learners with different L1 backgrounds. Given the results of previous studies that demonstrated L1 influence over L2 sentence processing (Altenberg, 2005; Cutler, 2001; Otake, 2006; Otake et al., 1996), EI would probably reveal the type of syntactic cues L2 learners use. More studies need to be carried out to explore how successfully EI elucidates L2 sentence processing by learners with various L1 backgrounds.

Flexibility of Adopting EI

One of the benefits of EI is its flexibility. EI can be used for evaluating learners at any proficiency level if stimuli include various types and length (Bley-Vroman & Chaudron, 1994). Also, a wide range of structures can be elicited with EI (Erlam, 2006; Jessop et al., 2007) in any language. Therefore, EI is particularly appropriate to measure learners' syntactic ability. EI is also applicable to measure other of areas of language abilities, such as pronunciation (Vinther, 2002). Henning (1983) reports that the pronunciation component of EI demonstrates the highest validity among other components, including grammar and fluency. EI also allows for flexible scoring. As Graham et al. (2008) suggest, no extensive rater training is necessary to conduct an EI task. Simultaneous administration to large number of students is possible if each test taker has access to an individual audio recorder. Scoring by automatic speech recognition may be possible (Graham et al., 2008). Additionally, EI allows researchers to evaluate learners' performances either in terms of quality or quantity (Hameyer, 1980).

Known Criticism Against EI

Despite the flexible use of EI, some researchers have cast doubt on the use of EI as a measurement of language development. The main criticism concerns the possibility of making a decision based on learners' rote repetition, also called parroting (Jessop et al., 2007; Vinther, 2002). If learners are able to repeat stimuli without understanding the

meaning or structure, EI only serves as a test of short-term memory, rather than language competence. However, many researchers claim EI is reconstructive in nature, as they have observed test takers' spontaneous correction of ungrammatical sentences during the task. Such spontaneity was taken as evidence for EI being reconstructive (Erlam, 2006; Hamayan et al., 1977; Markman et al., 1975; Munnich et al., 1991). Ungrammatical items are more difficult to repeat than grammatical items (R. Ellis, 2005), which is also taken as evidence that learners' imitation is not based on physical sounds, but rather on the natural language with which learners are familiar.

An effective solution to prevent the use of echoic memory is to ask learners to count to three before repetition (Mackey & Gass, 2005). As Cowan (1993) described, research has shown that learners are no longer able to reproduce sentences out of phonological short-term memory three seconds after they hear it. Tamai (2002) investigated whether learners' performance on shadowing accurately reflect their proficiency, and found the correlation between shadowing and the listening section of SLEP[5] was 0.285. This low correlation suggests learners' use of echoic memory on shadowing. Since shadowing encourages learners to repeat sentences simultaneously, it may enable low proficiency learners to produce sentences by parroting that go beyond their actual proficiency level. Researchers need to keep in mind that EI share some of the same problems observed with shadowing.

Other criticism includes the artificial nature of EI. In short, learners' performances in EI are not considered spontaneous speech (Bachman, 1990). In addition, there is a concern about unclear construct validity: whether EI measures participants' comprehension or production (Vinther 2002). Furthermore, as Jessop et al. (2007) indicate, determination of error type is hard to establish. For instance, it is difficult to decide whether learners' erroneous production is due to a pronunciation error or a

5 The SLEP (Secondary Level English Proficiency Test) was developed by Educational Testing Service. The rest was designed to measure nonnative speakers' listening and reading comprehension abilities.

grammatical error. Jessop et al. suggest reporting a detailed scoring scheme to enable replication. In fact, some EI- related research studies did not provide detailed scoring schemes. Lack of detailed information makes it hard for readers to examine whether learners' abilities are appropriately elicited. Since an EI task is highly controllable, planning the task carefully is vital in order to eliminate unmotivated variables that may hinder the results of EI. Such known negative factors are ceiling effect, floor effect and serial order effect. These effects will be discussed in the following section. Despite some criticisms, EI is recognized as a useful instrument as long as it is used with care (Vinther, 2002).

A Factor That Influences EI: Sentence Length

Sentence length is the most crucial factor that affects learners' performance during EI. An accumulation of previous studies suggests that appropriate cue length in EI should be long enough to challenge learners' STM (Bailey, Eisenstein & Madden 1976; Eisenstein, Bailey & Madden, 1982; Kelch 1985; Naiman 1974; Savignon, 1982). There is no strong consensus as to the appropriate length of a cue sentence (Vinther 2002). If a researcher wishes to find an individual's developmental stage, the complexity of the test sentences should be also taken into account (Bley-Vroman & Chaudron, 1994).

Researchers need to be aware of *ceiling effect* and *floor effect* when incorporating EI in their studies. The performance of L1 subjects in Lewandowsky and Murdock (1989) exhibited a ceiling effect for a four-item list and a floor effect for 10 or more items. The length of sentences should be decided to avoid high proficiency learners' ceiling effects and low proficiency learners' floor effects. Bley-Vroman and Chaudron suggest that subjects' performances can be scaled in terms of their continuous development if sentences of different lengths and types are used in the task.

A Factor That Influences EI: Serial Order Effect

Serial order effect is another important effect a researcher using EI needs to be aware of. This phenomenon is also known as serial position effect. In general, regardless of L1 or L2, the middle part of a sound string is difficult to recall when language learners are asked to repeat. Lewandowsky and Murdock's report (1989) shows that the serial order effect may be observed regardless of sentence length. Spitze and Fischer (1981) found serial order effects in both intermediate and advanced L2 learners' repetitions. The data indicate that intermediate learners suffer from serial order effect more seriously than advanced learners do. This is perhaps because more proficient learners are able to comprehend input as chunks; thus, phonological STM does not have to be occupied by recalling a large number of individual words. As a result, more advanced learners are able to invest their attention in all parts of a sound stream. In contrast, less advanced learners have difficulty finding meaningful chunks and are unable to comprehend how the entire sentence is constructed. They may still be able to recall the beginning and/or end of a sentence, which are the most salient parts of a sentence, but the middle section disappears from phonological STM because they cannot attend to it as well as the beginning and the end. The gravity of serial order effect diminishes as learners repeat the tasks (Lewandowsky & Murdock) or as proficiency rises (Spitze & Fischer).

The serial order effect may pose a serious negative impact if a researcher neglects to control the location of a target item in EI. For instance, if researchers wish to examine L2 learners' processing of various types of relative clauses, the location of relative clauses in stimuli must be consistent to avoid the serial order effect. Obviously, a direct comparison of a relative clause in a sentence initial position with one in a sentence internal position is inappropriate considering a possible serial order effect (Bley-Vroman & Chaudron, 1994). A syntactic element located in sentence initial position or in final position may not always be easy to recall if it is a low-salience item. The possibility of

accurate repetition of the same syntactic element may change depending on its location in a sentence.

A Factor That Influences EI: Semantic Support

To repeat a sentence accurately, a learner must remember what she or he just heard. However, memory is subject to decay as time passes. Learners were unable to repeat the sentences they failed to comprehend when a three to five second pause was imposed (McDade, 1982). Studies have shown that a sentence's meaning remains in memory much longer than its syntactic information (Kintsch et al., 1990; Sachs, 1967). Sachs investigated which type of changes-either syntactic or semantic-would be better recalled. In her experiment, participants were hearing a passage with four types of interrupting test sentences. Test sentences were interpolated at 0 syllables, 80 syllables, and 160 syllables, respectively, after the original sentence. The following four types of sentences served as test sentences: one that maintained the original meaning but in a form different from the original sentence; a second in which the meaning was changed; and sentences in different voices (the passive form that was originally in the active form or vice versa). Participants were asked to judge whether the interpolated sentence was the same as the original one, and to identify the type of the change if participants thought the original sentence and the interpolated sentence were different. They were also asked to indicate their confidence of their choice by circling one of the confidence ratings. The results revealed that, overall, a semantic change was more easily recalled than a syntactic change. Participants' judgments showed approximately 90% accuracy right after the original sentence. However, their recognition of syntactic changes dropped to nearly 60% accuracy after 80 syllables. On the other hand, participants' judgments about semantic changes exhibited approximately 80% accuracy after 160 syllables. The high accuracy rate is an indication of the significant role of semantic information for the recollection of information. The study further suggests that a learner needs to understand the meaning of

a sentence in order to perform satisfactorily on EI: recognition of syntactic information in stimuli alone does not help a learner repeat the entire sentence, especially after a pause is imposed.

Studies have shown that learners' repetition of meaningful stimuli is more accurate than repetition of stimuli lacking semantic information. Thus, the presence or absence of semantic information in lexical items would influence the success of a learner's EI performance. Spitze and Fitzer (1981) investigated ESL learners' recall of five sets of lists: random lists, related nouns (e.g. mountain-ocean-forest-lake-river-valley-stream-field), paired lists (e.g. hard-soft, hot-cold, etc.), scrambled sentences and regular sentences. Among the five sets, participants recalled regular sentences most accurately and random lists least accurately. Similar results were reported in Scott (1994) that investigated the memory span of monolinguals and bilinguals. Digits and discrete words disappear instantly from memory, probably because they do not create a meaningful chuck. The results of these studies agree with the findings of Miller (1958), suggesting that a sentence is better remembered than a random list of words because a sentence functions as a meaningful chunk. In sum, the possibility of a meaningless chunk being recalled is much lower than a meaningful chunk.

Summary of Chapter II

The discrepancy between L2 learners' knowledge and their automatic processing ability may be attributable to L2 learners' heavy reliance on explicit knowledge (R. Ellis, 2004). Their dependency on explicit knowledge causes serious problems, especially in the situation where learners do not have time to plan a task (Skehan, 1998). With regard to promoting automatic processing, there is a consensus among researchers that repeated practice is necessary. However, which type of knowledge-explicit knowledge or implicit knowledge-better facilitates L2 learning is still open for debate.

The SLA literature suggests that focusing learners' attention on particular elements of input would contribute to their acquisition (N. Ellis, 2005; Long & Robinson, 1998; Schmidt, 1990, 2001). However, drawing L2 learners' attention to a particular element in a sound stream is a considerable challenge, because their parsing is negatively influenced by their L1 (Culter, 2001; Otake, 2006; Otake et al., 1993; Otake et al., 1996). In addition, limited exposure to a target language is another disadvantage L2 learners encounter, one that leads to failure to recognize low-salient L2 features. An example of such a low-salient item is a bound morpheme (N. Ellis, 2008). The meta-analysis of empirical studies on L2 segmentation revealed that the ability to use syntactic information was situated in the last part of a developmental continuum (Johnston & Doughty, 2007). Studies have suggested that differences in learners' parsing of L2 sentences are attributable to their WM capacity. That is, learners with high WM are able to store information in their memories while processing new input. In contrast, poor WM learners are unable to process L2 sentences in a brief period of time (Miyake & Friedman, 1998). Sentence length, semantic information included in lexical items, the location of a particular element in a sentence and sentence complexity all influence the accuracy of sentence recollection (Bley-Vroman & Chaudron, 1994).

Research Questions

Given the positive results of previous studies that incorporated effective use of additional attentional resources (Frick, 1984; Martin, 1980; Mousavi et al., 1995), a logical solution to enhance L2 learners' segmentation is reducing their cognitive load. The current study intends to enhance L2 learners' sentence processing by providing visualized chunks. Additionally, the current study sheds light on the questions left unanswered concerning L2 segmentation, specifically, how multiple syntactic elements in a complex sentence would influence sentence processing. The following research questions are posed to seek answers for the above issues.

1. Do visualized chunks promote the reconstruction of a complex sentence from aural input?

   Hypothesis: Learners' WM capacity does not suffer much when visualized chunks are available. Both chunking (Miller, 1956) and dual modality support (Frick, 1984; Martin, 1980; Mousavi et al., 1995) contribute to the effective use of WM. Therefore, L2 learners' reconstruction of sentences with pictorial information is more successful compared to that of sentences unaccompanied by pictures. As a result, serial order effect is weakened when visualized chunks are available.

In the current study, visualized chunks represent a complex sentence accompanied by corresponding pictures. Pictorial information plays two significant roles: it provides semantic information and indicates boundaries between clauses. Visualized chunks enable L2 learners not only to grasp the meaning, but also to view the chronological order of events in a complex sentence. These two benefits are expected to reduce L2 learners' cognitive load. In Japanese, inflectional morphemes carry pertinent semantic information and are used to connect clauses; thus, the recognition of morphemes is essential for the processing of complex sentences. However, bound morphemes are difficult to recognize due to lack of perceptual salience (Bates & Goodman, 1997; N. Ellis, 2008). Bringing learners' attention to inflective morphemes is crucial for the successful segmentation of Japanese complex sentences.

2. Do salience and frequency in input influence L2 learners' reconstruction of a complex sentence? In other words, among syntactic elements that differ in terms of salience and length of exposure, are there any specific syntactic elements that are particularly challenging for L2 learners to process?

Hypothesis: Inflective morphemes are the most difficult to reproduce in comparison with other syntactic elements. The order of successful reconstruction of Japanese inflective morphemes according to the length of exposure is: *-te* > *-tari* > *-tara*

Under the Noticing Hypothesis, the amount of exposure plays a significant role in noticing. It has been argued that frequently repeated items are recalled more effectively (Bybee, 2008; N. Ellis, 2002, 2003; Millar, 1956). Thus, it is reasonable to expect that learners of the current study are able to process *-te* , to which they have been exposed for more than two semesters, better than *-tari* or *-tara*. The current study supports the same position with R. Ellis (2005). That is, the processing of items that are within L2's interlanguage is automatized with practice, but unfamiliar items are not. In the case of the current study, the newly learned morpheme *-tara* may not draw learners' attention even with dual modality support. The order of a successful reconstruction of inflective morphemes is predicted based on the findings of Mackey et al. (2002) and Philip (2003). These studies suggest that an item that is too advanced for learners is less likely to be processed.

3. Does the ability to reconstruct complex sentences predict individuals' receptive L2 proficiency? Also, does L2 learners' performance on dual modal support and without dual support reveal their receptive proficiency?

   Hypothesis: Learners' performance on EI predicts proficiency. The successful repetition of inflective morphemes is a better indicator of receptive L2 proficiency than that of other syntactic elements. Less proficient L2 learners particularly benefit from dual modal support whereas more proficient learners are able to perform well without dual moral support. Therefore, L2 learners' EI score gain under dual modal support predicts their receptive proficiency.

Given the high reliability of EI found in previous L2 studies (e.g. Erlam, 2006; Graham et al., 2008; Henning, 1983), it is fair to expect that L2 learners' performance on EI in the current study also predicts their general L2 proficiency. The acquisition of morphemes occurs in a relatively late stage of L2 learning (Johnston & Doughty, 2007). Thus, the ability to reproduce inflective morphemes in particular may be a solid indicator of L2 competence. Studies have shown that less advanced learners rely on lexical information for processing (Johnston & Doughty, 2007) and such learners' performance is enhanced with the support of pictorial information.

CHAPTER III

DESIGN OF THE EXPERIMENTS

Introduction

The focus of this chapter is to explain how the experimental part of this study is designed to elucidate L2 learners' working memory and their ability to process complex sentences. Since this study assumes frequency of input and the location of inflectional morphemes within a sentence influence learners' processing of input, this section provides detailed description of these two elements. As discussed in previous chapters, Elicited Imitation (EI) is considered to be an appropriate tool to examine learners' implicit knowledge, which is facilitative in processing complex sentences. Therefore, this experiment must satisfy the conditions and purpose of EI. This chapter is organized as follows. First description of participants is presented. Next this chapter introduces the test design explaining how items in the experiment are chosen and tested prior to the main study. The test design section is followed by the procedures of the study. This chapter concludes with the description of the analyses of the experiment.

Participants

Thirty five students (23 males and 12 females) enrolled in the second-year Japanese at a university located in Midwest participated in the experiment. Participation in this experiment was voluntary and all participants received compensation. The experiment was conducted in the beginning of their fourth semester of Japanese courses in the university. Participants have completed three semesters of Japanese at their university or passed a placement test to be enrolled into the course. The majority of the participants speak English as their L1. Among three non-native speakers of English, one speaks Korean as her L1 and two speak Chinese as their L1. These non-native speakers of English have a solid command of English.

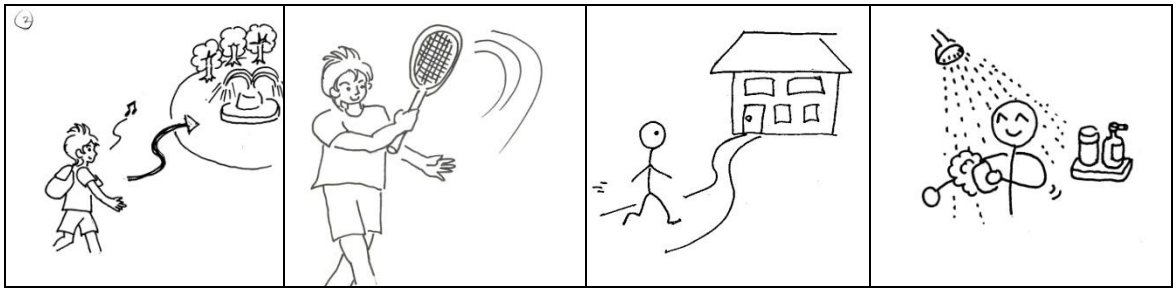
Test Design

Materials

The study employs EI under two different conditions: one with pictorial information and the other without pictorial information. Microsoft PowerPoint was used to create the two conditions. All the pictures used in this experiment were drawn by the researcher. It was highly possible that poor quality of picture affects participants' correct repetition of stimuli. Therefore, the usability of all pictures was tested prior to the main study. The researcher showed the pictures to approximately 20 graduate students who were teaching language courses at The University of Iowa, and asked what activity each picture would represent. Pictures that were not correctly identified by a graduate student were all removed, and the researcher continued to re-draw pictures until they were identified correctly.

Figure 3.1. Stimuli with Pictures

kooen ni itte	*tenisu o shitara*	*uchi ni kaette*	*shawaa o abimasu*
After (I) go to a park and	play tennis	go home and	take a shower.



As shown in Figure 3.1, pictures represented four verbs used in a stimulus and they were synchronized with a sound. When the researcher clicked a mouse, pictures

appeared one by one on the screen. All sentences were digitally recorded to keep the speed and volume of voice consistent throughout the experiment, and were read at a natural speed by a male native speaker of Japanese. The native speaker was not informed which sentences were stimuli and distracters to avoid any emphasis that he may otherwise place in sentences. Recorded sentences were separated by a pause using the digital audio editor Audacity. There was a less than 0.5-second pause between clauses. The recorded sentences were designed to start when the researcher clicked a mouse to ensure that learners listened to each stimulus only once.

This study assumes that pictorial information helps learners to process complex sentences effectively, mainly for two reasons. First, the four pictures used in this study assist L2 learners in recognizing meaningful chunks from a sound sequence. The four pictures immediately communicate to learners that the complex sentences they are asked to repeat consist of four verb phrases. Second, it is assumed that pictorial information will reduce learners' cognitive overload and enable them to pay more attention to the structure of a sentence they hear, given the results from studies that confirmed dual modality support (Frick, 1984; Martin, 1980; Mousavi et al., 1995).

This study also hypothesizes that learners' ability to imitate complex sentences is related to their proficiency. To test this hypothesis, the results of EI were analyzed on the basis of participants' performances on the Japanese standardized proficiency test. All questions were given in multiple-choice formats. Since the test does not include any free production task, it is considered to measure learners' receptive proficiency. Therefore, the results of this experiment are only relevant to receptive proficiency.

Target Structures

Each stimulus in this experiment consists of four verbs and includes two target structures. Table [1] shows the three types of inflective morphemes that serve as target structures used in this study. This study assumes that frequency of input influences

learners' processing, as it is one of the key factors for language acquisition to occur regardless of L1 or L2 (N. Ellis, 2002; 2008; Lieven & Tomasello, 2008). Thus, the three target structures for this experiment were chosen according to the length of exposure, assuming that the length of exposure of the target forms is associated with frequency of input. These three structures adopt the same conjugation rules; thus, the difficulties of conjugation are controlled. It is expected that the easiest form for learners in this experiment is the *te*-form, since learners have been exposed to it since the beginning of the second semester. Likewise, the expected most difficult form is the *tara*-form.

Table 3.1. The Inflective Morphemes That Serve as Target Structures

Form	Function	Meaning in English	Learners' exposure to the structure
1. The *te*-form	Chronological order of activities	Do X, Y and Z in order	Approximately two semesters
2. The *tari*-form	Inexhaustive listing of activities	Do things such as X and Y in no particular order	Approximately one semester
3. The *tara*-form[6]	Timing of activities	When… or after…	Approximately half a semester

The three target structures have other functions besides those listed in the table; however, the function of each structure in the stimuli is limited to the one mentioned in the table. The three structures also require the same conjugational rules (see Appendix A for examples). All stimuli end with a verb in the polite affirmative form, the *masu* form,

[6] *-tara* is used in a subordinate cause to indicate an action or state that has taken place prior to the action or state in the main clause (Makino & Tsutsui, 1986).

in the present tense, to which learners have been most frequently exposed in class since the beginning of the first semester of Japanese. The last verbs of all distracters are also in the polite form, but some of them are in the past tense.

Sentence Type

This study assumes that both learners' exposure to a structure and the location of the structure within the sentence influence their input processing. To create conditions that enable examination of these two factors, five sentence types were used for this experiment. The five types of stimuli are indicated in Table 3.2. The sentences used as stimuli were considered to be challenging for most learners, as learners had only infrequent exposure to complex sentences consisting of four verbs that are connected by more than one inflectional morpheme. Prior to the experiment, stimuli were tested on three L2 learners who had completed two years of college-level Japanese courses. Even though they reported the difficulty of repeating long sentences, they were able to complete the task without a major problem[7]. The learners were asked if they recognized any patterns in input, and none of them recognized the patterns. Therefore, the researcher concluded that the repetition of stimuli was challenging yet manageable for the participants of this study.

[7] Prior to the pilot test, several stimuli were tested on L1 Japanese adults and a child. They were all able to repeat stimuli successfully. They commented that remembering all elements in long sentences was quite challenging.

Table 3.2. Sentence Types in Stimuli

a. …*te, ….te, …tara*, sentence-final predicate …*masu* e.g. *baa ni itte ongaku o kiite osake o nondara*[8] *uta o utaimasu*. = (I'm) going to a bar, then (we'll) listen to music and after (we) drink (we'll) sing.
b. …*tara, …te, …te*, sentence-final predícate …*masu* e.g. *asa okitara, mado o akete, shawaa o abite shinbun o yomimasu.* = After (I) wake up, (I) open the windows, take a shower and read a newspaper.
c. …te, …tara, …te, sentence-final predicate …*masu* e.g. *hon o yonde shukudai ga owattara konbini ni itte arubaito o shimasu*. = (I'll) read a book, do my homework and when (I'm) finished, (I'll) go to a convenience store and work.
d. …*te, …tari, ...tari*, coordinating verb *shimasu* e.g. *kooen ni itte, shashin o tottari, tenisu o shitari simasu*. = (I'll) go to the park and do things such as take photos and play tennis.
e. …*tara, …tari, ...tari*, coordinating verb *shimasu* e.g. *shiken ga owattara, arubaito o shitari, kanojo to dekaketari shimasu*. = When the exam is over, (I'll) do things such as work and go out with my girlfriend.

Sentence types of *a, b,* and *c* are created to investigate the effect of location within a sentence. Within these sentence types, the *tara*-form was placed in the different locations. If L2 learners are indeed susceptible to the serial order effect during the repetition of a complex sentence; that is to say, if the middle position of a sentence is difficult to attend to while repeating, then the most difficult sentence type for them should be type *c*, as the *tara*-form is located between the *te*-forms. For L2 learners in this study, the *tara*-form in sentence type *a* should be more challenging than that in sentence type *b*, as the *tara*-form in type *a* is closer to the middle of the entire sentence than as the *tara*-form in type *b* is.

[8] Some verbs end with –*mu*, -*bu* or –*nu* in the plain form. In such a case, *ta* in the -*tara* is voiced; thus, it changes to -*dara*. Similarly, *te* changes to "-*de*".

In order to examine how the length of exposure influences learners' successful repetition, different inflectional morphemes were placed in the same location of different sentence types. For instance, sentence type *d* (*…te, …tari, ...tari*) and type *e* (*…tara, …tari, ….tari*) allows the comparison of the *te*-form and the-*tara* form, and the repetition of the *te*-form in type *d* is expected to be easier than the repetition of the *tari*-form in type *e*, given learners' longer exposure to the *te*-form. Similarly, sentence type *b* (*…tara, …te, ….te*) and sentence type *e* (*…tara, …tari, ….tari*) are used to compare the *te*-form and the *tari*-form, and the repetition of the *te*-form in type *b* is expected to be easier than the repetition of the *tari*-form in type *e* due to learners' longer exposure to the *te*-form.

Each type has 12 unique varieties of sentences; thus, the total number of stimuli is 60 (see Appendix B). Ellis and Sinclair (1996) discovered that learners' repetition of novel Welsh words and structures that were presented to them without any context during a one-time experiment led to the acquisition of the words and the structures. The result of their experiment indicated that learning could occur solely by repetition. Since this experiment involves the repetition of 120 sentences, an effort was made to discourage learners from making predictions by remembering the sentences they repeated previously. Thus, the maintenance of a variety of sentences learners are asked to repeat is a crucial issue for this experiment. During a testing phase of this experiment, it became apparent that presenting exactly the same sentences during a short period of time resulted in the creation of a practice effect. Therefore, priority was given to avoid learners' successful repetition due to a practice effect, and this led to the use of entirely unique sentences as stimuli. Avoidance of a practice effect caused another problem: the disallowance of the direct comparison of with- or without-picture conditions using the same sentences. In order to mitigate this problem, an effort was made to maintain the same level of difficulty across stimuli. That is, this study chose the lexical items and the structure of each phrase within a sentence that were comparable across unique sentences.

Sentence Length

As discussed in chapter II, there are some factors that may skew the result of EI. One such factor is often called "parroting", mere repetition without understanding meanings and structure of a sentence. This may occur if a sentence is short and too easy to recall. Also, as Lewandowsky and Murdock (1989) reported, results of repetition tasks may be affected by the ceiling effect if a stimulus is too short and the floor effect if a stimulus is too long. The sentence length for EI must be long enough to challenge learners' short-term memory. Special care was paid to establish the appropriate length of stimuli, to make stimuli long enough to challenge learners' working memory while they are not too long for learners to repeat. No study thus far has investigated L2 Japanese learners' performance on EI with complex sentences. Therefore, preliminary testing was conducted in an attempt to establish appropriate length. A floor effect was apparent if a sentence exceeded 35 morae[9]. The preliminary testing revealed that the appropriate length for early intermediate (or late elementary) Japanese learners would be approximately 30 morae. The length of the stimuli used in the study is approximately 29 morae; the shortest stimulus has 26 morae and the longest stimulus has 32 morae.

Ideally, all stimuli should be exactly the same length to make a direct comparison of learners' performance across stimuli. Specifically, if all nouns and verbs are the same length across all stimuli, a researcher may expect a serial order effect at the exact location of each stimulus. For instance, if the seventh and eighth morae always correspond to the first verb inflectional morphemes, a researcher can assume that the seventh and eighth morae are difficult to repeat accurately. However, choosing nouns and verbs in the same number of morae across 60 unique stimuli was extremely difficult, considering the limited number of nouns and verbs with which the majority participants in this

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[9] Mora (plural morae) is a unit of sound in Japanese. Possible moraic structures in Japanese are CV (consonant vowel), CCV, V, nasal coda ([n] or [m]) and doubled consonant such as [tt], [tts], [kk], [pp] and [ss]. (Otake et al., 1993).

experiment were familiar. The use of nouns and verbs with different numbers of morae was unavoidable in order to maintain the variety of lexical items in the stimuli, which is essential for the avoidance of a practice effect. Therefore, effort was made to keep the entire sentence between 26 and 32 morae.

Lexical Items

All of the lexical items used in the experiment were selected from the vocabulary in the textbook participants have used, and were introduced during their first year of Japanese with a few exceptions[10]. All of the items frequently appeared both in the textbook and during class; therefore, it was expected that participants had sufficient familiarity with the lexical items to complete the task. During the preliminary testing, it was found that some learners had difficulty recalling proper nouns, and the difficulty affected their performance. Therefore, no proper nouns were included except *nihon* (Japan). Lexical items were randomized in such a way that learners could not expect a particular lexical item in a particular structure or in a particular location of a sentence. In addition, no vocabulary item was used more than once in a single sentence, and no vocabulary item within the same sentence type appears more than three times with the exceptions of *suru* 'to do' *iku* 'to go' *kaeru* 'to go home'[11]. Type-token ratio[12], a measurement of variety of lexical items, is shown in Table 3.3.

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10 "To turn on" "to turn off" and "to close" were the exceptions that were introduced during their third semester of Japanese study.

11 They are located in various positions in a sentence to prevent learners from making associations among these verbs, forms, and their locations in a sentence.

12 Type-Token Ratio = (number of types/number of tokens) * 100. A low type-token indicates a low variety of lexical items.

Table 3.3. Type-Token Ratio of the Lexical Items by Sentence Types

	Type a		Type b		Type c		Type d		Type e	
	W/out picture	With picture	W/out picture	With picture	W/out picture	With picture	W/out picture	With picture	W/out picture	With picture
noun	75.0	87.0	82.6	91.3	73.9	75.0	94.4	83.3	88.9	94.4
particle	22.7	21.7	18.2	17.4	17.4	18.2	22.2	22.2	38.9	27.8
verb	66.7	70.8	79.2	79.2	70.8	70.8	70.8	45.8	62.5	58.3

Distracters

All distracters consist of three clauses and end with a verb. Some clauses in distracters include adjectival phrases and perfectives. Distracters are similar to stimuli insofar as all structures are chosen from those taught in class prior to the experiment; thus, learners are considered to be familiar with them. Table 3.4 shows structures that were used only as distracters. No forms used in distracters require conjugation. Table 3.5 indicates sentence types in distracters. Lexical items were chosen by the same criteria as those in the stimuli. The number of distracters is 60 and the length of distracters varies from 18 morae to 32 morae (see Appendix C).

Table 3.4. Structures That are Used in Only Distracters

Structures	Function	Meaning in English	The period learners have been exposed to the structure
1. the plain form + *shi*	inexhaustive listing of reasons	because of X and Y (in no particular order)	approximately half of a semester
2. *...to iimashita* *... to kikimashita* *... to omoimasu*	quotation and hearsay	(I) said that (I) heard that (I) think that	approximately one semester
3. conjunction *kara*	expressing a reason or a cause	because; so	approximately two semesters
4. conjunction *kedo*	indicating a contrastive meaning	although; though	approximately half of a semester

Table 3.5. Sentence Types in Distracters

a. …*kara,…to iimashita/kikimashita/kakimashita* e.g. *terebi o miru <u>kara</u> denki o kesu <u>to iimashita</u>.* = <u>(I) said</u> "(I'm) watching TV <u>so</u> (I'll) turn off lights."
b. …*shi, …kara,* sentence-final predicate e.g. *onaka ga itai <u>shi</u> netsu mo aru <u>kara</u>, konban takusan nemasu*. =My stomach hurts <u>and</u> I have a fever too, <u>so</u> I'll sleep a lot tonight.
c.…*kedo, ...kara,* sentence-final predicate e.g. *onaka ga itai <u>kedo</u> tenki ga ii <u>kara</u> tenisu o shimasu*. = My stomach hurts <u>but</u> the weather is nice, <u>so</u> (I'll) play tennis.

Procedures

Elicited Imitation

Participants engaged in the EI task individually in a small room in a language laboratory. They were asked to repeat sentences they heard from aural input as accurately as possible and were allowed to listen to each sentence only once. Before engaging in the task, the researcher demonstrated how to do the task. After the demonstration, participants were given an opportunity to practice EI. They practiced on five distracter sentences, and the volume was adjusted to the level at which each participant could hear sentences comfortably. They were asked to count 1, 2, 3 before repeating[13].Since EI required participants' concentration and swift response, the task might be intimidating for some participants especially if they were unable to parse a long sentence. Therefore, it was important to let them familiarize themselves with the task prior to the experiment. The following instruction was displayed on the computer screen before practicing.

> You are asked to repeat the 120 sentences you will hear. Request a short break when you get tired. Half of the sentences will be accompanied by pictures. You are free to skip any part or any sentence.

Half of the sentences were accompanied by pictures and sentences with pictures and without pictures were interspersed. The ratio of stimuli to distracters was 1:1. The researcher controlled the entire session to ensure that learners listened to each stimulus only once. No time limitation was imposed on participants when they repeated stimuli. This allowed participants' use of explicit knowledge. It was possible for them to rephrase words or sentences if they wished. Participants took a break after completing half of the

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[13] This instruction is given in order to preclude participants' use of echoic memory.

task. Most participants took approximately 30 minutes to complete the task. Participants' performances were also digitally recorded for analyses.

Standardized Proficiency Test

The current study adopted a modified version of the Japanese-Language Proficiency Test to examine to what extent learners' ability to reconstruct stimuli would be accounted for by their receptive proficiency. The test is a standardized test that evaluates the language proficiency of L2 Japanese learners. It consists of three parts: characters and vocabulary, listening comprehension, and reading comprehension and grammar. At the time the test was administrated for the current study, there were versions of the test targeted at four different proficiency levels. Level 4 was the most basic level and Level 1 was the most advanced level. The participants of the main study had studied Japanese approximately 275 hours when they took the proficiency test; therefore, Level 3 was considered to be the most appropriate level for them. Level 3 is normally reached after studying Japanese for approximately 300 hours in class.

The original Level 3 test takes 140 minutes to complete all sections. However, only 100 minutes were available for the main study. It was necessary to make a modification to compensate for the lack of testing time and in-class study time to reach Level 3. Prior to the main study, the researcher administrated a pilot test to determine which questions might have been too advanced for participants of the main study. A student who was enrolled in the third year Japanese course volunteered to take the entire test. The researcher eliminated some questions that the third year student was not able to solve based on the results of his test performance. However, the same weight system was maintained. Table 3.6 shows the comparison of the original and the modified version of the test. The modified version of the test was administrated during two regular class sessions, which was approximately after one month to two months of individual EI sessions.

Table 3.6. Comparison of the Original and the Modified Version of the Japanese Language Proficiency Test

	Characters and Vocabulary	Listening Comprehension	Reading Comprehension and Grammar	Total
Original Test	55 questions 100 pts, 35 min	26 questions 100 pts, 35 min	50 questions 200 pts, 70 min	131 questions 140 min
Modified Test	45 questions 100 pts, 30 min	13 questions 100 pts, 20 min	42 questions 200 pts, 50 min	100 questions 100 min

Analysis

Introduction

All sentence types are analyzed individually to examine a) how L2 learners' length of exposure to each inflective morpheme relates to their successful repetition and b) whether the location of inflective morphemes affects L2 learners' successful repetition, under the assumption that both a) and b) are responsible for L2 learners' difficulty of processing complex sentences. For the investigation of the relationship between learners' overall Japanese proficiency and their performance on EI, all sentence types are analyzed compositely.

Unit of Analyses for Elicited Imitation

In order to visualize a serial order effect, all elements that were included in the sentence the learners imitated have to be analyzed. A typical serial position curve is described in terms of the number of words accurately imitated. For instance, as shown in Figure 1.1 of chapter I, the Y axis indicates percentage of accurate imitation of each word, and the X axis indicates the length of a sentence that learners produced. If a serial order effect exists, a serial position curve will be observed in the medial position of a sentence.

To examine serial order effect, researchers typically choose exactly the same number of words across all stimuli. For instance, all stimuli used in Spitze and Fischer (1981) consist of eight words. However, this study needs to adopt a more finely granulated scoring scale to elucidate how learners process verbs, in particular, inflective morphemes that are used to connect phrases. Since this study hypothesizes that inflective morphemes in the sentence medial positions are difficult to process, the location of four verbs' inflective morphemes must be clearly identified when visualizing the serial order effect. Thus, learners' imitation of each verb was further dissected into three parts: appropriate choice of a verb, appropriate conjugation of a verb and appropriate choice of an inflective morpheme. As shown in Table 3.7, sentence types *a, b,* and *c* are divided into 20 components[14], so that 20 points are awarded if a learner perfectly repeats a stimulus. Similarly, sentence types *d* and *e* are divided into 18 components; therefore, a highest possible score for these types is 18 points. The numbers that correspond to these components are plotted along the X axis to capture the serial order effect.

[14] Sentence types *a, b* and *c* include two sentences that end with an intransitive verb such as "to go to bed". These sentences do not have a noun and a particle that corresponds to 16 and 17 respectively shown in Table 3.7. Thus, these six sentences are excluded from the analyses that intend to illustrate serial order effect.

Table 3.7. Unit of Analyses

Sentence Types *a*, *b* and *c*

first verb phrase		second verb phrase		third verb phrase		fourth verb phrase	
1	noun	6	noun	11	noun	16	noun
2	particle	7	particle	12	particle	17	particle
3	verb choice	8	verb choice	13	verb choice	18	verb choice
4	verb conjugation	9	verb conjugation	14	verb conjugation	19	verb conjugation
5	verb inflective morpheme	10	verb inflective morpheme	15	verb inflective morpheme	20	verb inflective morpheme

Sentence Types *d* and *e*

first verb phrase		second verb phrase		third verb phrase		fourth verb phrase	
1	noun	6	noun	11	noun		
2	particle	7	particle	12	particle		
3	verb choice	8	verb choice	13	verb choice	16	verb choice
4	verb conjugation	9	verb conjugation	14	verb conjugation	17	verb conjugation
5	verb inflective morpheme	10	verb inflective morpheme	15	verb inflective morpheme	18	verb inflective morpheme

Scoring Elicited Imitation

Learners' imitation was analyzed separately under the audio-only condition and the audio-with-pictorial-information condition. Also, all elements mentioned in the previous section were scored for production and accuracy. The following is the coding scheme the two raters used for scoring.

Production Scoring

As for the production scoring, one point was awarded when each element was produced, irrespective of accuracy. When a learner rephrased a noun or a verb multiple times, only the one the learner produced last was counted. Learners frequently omitted "*-tari shimasu"* in sentence types *d* and *e*, as shown below.

Original stimulus

Heya ni haitte denwa o kaketari konpuutaa o tsukattari shimasu.

= (I) enter a room and then do such things as telephone, use a computer, etc.

Typical example of learners' repetition

Heya ni haitte denwa o kaketari konpuutaa o tsukaimasu.

The coordinating verb "do" in the original stimulus immediately follows the inflectional morpheme "*-tari*" in the third VP. Sometimes it was difficult to determine whether learners failed to process the coordinating verb *shimasu* but produced a verb in the third VP using a different lexical item (e.g. *konpuutaa o shimasu* [blank] 'do a computer (work)' instead of saying 'use a computer'), or a learner omitted a verb in the third VP but produced the coordinating verb successfully (e.g. *konpuutaa o* [blank] *shimasu*). In such a case, raters paid special attention to a pause to determine which verb was omitted. If there was no obvious pause between a particle "*o*" and a verb *shimasu* in the third VP (e.g. *konpuutaa o* [no pause] *shimasu*), the coordinating verb *shimasu* at the end of the sentence was considered to be missing. On the other hand, if there was an obvious pause between a particle "*o*" in the third clause and the coordinating verb "do" (e.g. *konpuutaa o* [a pause] *shimasu*), a verb in the third VP was considered to be missing.

Accuracy Scoring

Regarding accuracy, one point was awarded only if a correct item was produced in its correct position. In other words, no point was given when an item was produced in a different location from the original sentence, even when the learners' production was grammatically correct. As mentioned in the previous section, verbs were further divided into three parts in an attempt to illustrate the serial order effect. Therefore, three points were awarded if a learner's repetition of a verb was accurate. If a learner's choice of a verb was inaccurate but the form was correctly repeated in the right position, a point was given only for the form. Special care was paid to the distinction between a verb-choice error and a verb conjugation error. Raters carefully attended to a learner' intonation when the identification of error type was difficult solely by looking at transcription. For example, when a learner produced *nonde* when he heard *notte* (to take/ride a vehicle), it was not clear whether he/she used a wrong lexical item (*nonde* is the correct *te*-form of 'to drink'), or he/she picked a correct lexical item 'to ride' but his conjugation was wrong. In such a case, intonation was taken into consideration. If the learner's intonation of *nonde* was close to the correct intonation of 'to ride', it was considered as a conjugation error. Similarly, if the learner's intonation of *nonde* was close to 'to drink', the error was considered to be due to a wrong lexical choice.

During the experiment, learners sometimes rephrased the original lexical items with others that were compatible in meaning. For instance, instead of saying *gohan o tsukuru* 'to make a meal' some learners said *ryoori o suru* 'to cook'. In such a case, 0.5 points were given for an appropriate substitution. Also, there were some instances where learners replaced the original noun with a more general term, such as *nomimono* 'drinks' instead of *mizu* 'water'. 0.5 points were also given for this type of substitution. Pronunciation errors were ignored as long as they did not confuse the meaning of the original sentence.

Interrater Reliability

To ensure the accuracy of scoring, the researcher and a second rater transcribed and scored twenty percent of the entire data set. The following steps were used to insure interrater reliability. Prior to the scoring of EI, the researcher and two Japanese graduate students scored the modified version of the proficiency test. The graduate students graded the test first and the researcher checked the accuracy of their scoring. The researcher randomly picked seven data sets, which represented twenty percent of the entire data set, according to the distribution of participants' test performance. Their test performance was normally distributed. The researcher randomly picked one data set from the lowest and one from the highest groups. Each of these groups was more than one standard deviation away from the mean (each representing 16% of the normal distribution). Additionally, the researcher chose at random five data sets from the middle group that represented 68% of the normal distribution.

For EI scoring, the researcher randomly picked another data set to conduct a training session. The researcher and a second rater each transcribed and scored the first 20 sentences of the data set. After the two raters discussed discrepancies and reached an agreement, they transcribed the primary seven data sets. When the raters found discrepancies between the two transcriptions, a third rater decided on which transcription was more accurate. It turned out that the discrepancies were attributable mainly to each rater's interpretation of long vowels and double consonants. The same two raters individually scored the transcriptions adjusted by the third rater. The agreement rate between the two raters was 97.8%. After two raters discussed how to reduce discrepancies, the first rater transcribed and scored the rest of the data. As a final measure to achieve accurate transcription, the rater paid special attention to the length of each mora to identify long vowels, as well as to the presence of aspiration to determine a double consonant.

Chapter III Summary

This chapter presents general description and operationalization of the study. Effort was made to visualize the serial order effect on L2 Japanese learners' reconstruction of complex sentences. Since no previous studies have examined L2 Japanese learners' processing of complex sentences, pilot testing was extremely important to test the durability of the task. Choice of lexical items and determination of sentence length were particularly important to avoid undesirable factors such as practice, ceiling and floor effect. As results, all participants successfully completed the repetition task and there was no major negative event occurred during the experiment. Considering the high intensity of the task, all learners' successful completion of it was ascribed to the careful examination of the task and pilot testing. The results of the research are presented in chapter IV.

CHAPTER IV

RESULTS

Introduction

To answer the research questions posed in chapter III, this chapter presents results in the following manner. In response to the first facet of the first research question, regarding the effect of pictorial support on L2 Japanese learners' reconstruction of complex sentences, the current study compares learners' performance under without-picture and with-picture conditions, and analyzes their performance by syntactic elements and by sentence types. Sentence-type analyses intend to illustrate the serial order effect, a phenomenon in which learners' recall of a sentence's internal elements declines. The current study hypothesizes that pictorial information reduces learners' cognitive load, thus enabling them to better reconstruct syntactic elements, regardless of their position in a complex sentence, than they would in situations where pictorial information is unavailable.

To answer the second research question concerning particular syntactic elements that cause difficulty in processing complex sentences, the current study measures learners' performance quantitatively by (a) five syntactic elements in a complex sentence, (b) three types of inflective morphemes and (c) two types of clauses in which particles are included. As discussed in chapter II, previous studies have found the use of syntactic cues in sentence processing to be more challenging for L2 learners than other cues. However, L2 learners' ability to process Japanese verb morphology still needs to be explored. This chapter intends to provide detailed analyses of the effect of location on the processing of verb morphology in complex sentences.

The third research question concerns whether L2 learners' ability to reconstruct sentences from aural input relates to their receptive proficiency. The current study mainly

examines two factors. The first factor is learners' ability to utilize pictorial information, and the second factor is their ability to reproduce syntactic elements.

The Effect of Pictorial Support

Effect of Pictorial Support to Elements in a Complex Sentence

Learners' performances on EI (Elicited Imitation) under without-picture and with-picture conditions are analyzed separately. Table 4.1 indicates learners' performance on EI. Participants' scores were normally distributed, ranging from 264 to 899 points. All participants performed better under the with-picture condition. Notice that the best performer on EI earned only 78.86% of the maximum score, suggesting that the current study's EI task was quite challenging even for these who performed best. The results also suggests that the current study successfully avoided "parroting," namely, imitation of sentences without understanding the meaning. If parroting were possible during this experiment, learners with strong short-term phonological memory would have earned nearly perfect scores. However, the best score was far below 100% even under the with-picture condition. On average, learners earned approximately 55% of the maximum score.

Table 4.1. Descriptive Statistics for Learners' Performance on EI (n=35)

	Highest Possible Score	Range	Mean	Median	STD
All	1140	264 - 899	627.13	625.50	136.34
Without Picture	570	103 - 417	218.14	203.50	77.13
With Picture	570	161 - 493	406.87	428.00	71.35

Table 4.2 shows the effect of pictorial support on the reproduction of each element in complex sentences. As mentioned in chapter III, each of the first three VPs in stimuli consists of a noun, a particle, a lexical choice of a verb, a conjugation and an inflective morpheme (either *-te, -tari,* or *-tara*). The last VP in sentence types *a, b* and *c* and the coordinating verb 'do' in sentence types *d* and *e* end with a sentence-final predicate *-masu*, instead of an inflective morpheme. Thus, the last VP and the coordinating verb 'do' were excluded from this analysis. The highest total score possible is 180 points for each element. As for nouns, particles, and lexical choices, standard deviation of the without-picture condition is larger than that of the with-picture condition. On the other hand, regarding conjugations and inflective morphemes, larger standard deviation is observed in the with-picture condition.

Table 4.2. Descriptive Statistics for Learners' Performance on EI by Components (n=35)

Elements	Noun		Particle		Verb Choice		Conjugation		Inflective Morpheme	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD	Mean	STD
Without Picture	43.37	12.84	40.86	13.82	36.81	13.05	30.10	13.08	27.56	11.87
With Picture	74.83	8.37	70.70	10.04	73.24	10.42	61.73	14.09	46.87	13.52
Total	59.10	19.15	55.78	19.23	55.03	21.77	45.91	20.88	37.21	15.94

A two-way ANOVA revealed that there was a main effect for Pictorial Support, $F(1, 340) = 515.98$, $p < .001$, $\eta^2 p = .603$, and a significant interaction for Pictorial Support x Elements, $F(4, 340) = 4.67$, $p = .001$, $\eta^2 p = .052$. Paired t-tests indicated that

learners produced all components significantly better when they were able to view pictorial information than when they were deprived of such information ($p < .001$). The results suggest that pictorial information significantly contributes to the reproduction of all elements. Cohen's d[15] for nouns is 2.90, 2.47 for particles, 3.09 for lexical items, 2.33 for conjugations and 1.52 for inflective morphemes. Among the five components in this study, pictorial information proves most beneficial in the reproduction of correct lexical items and least beneficial regarding inflective morphemes. The contribution of pictorial information to the reconstruction of nouns and verb lexical items is easily predicted as pictures immediately provide learners with such information. It is worth noting that pictorial information also contributes to the reconstructions of particles, conjugations and inflective morphemes despite the fact that pictorial information lacks visual cues for such syntactic elements.

Visual Displays of Learners' Production and Accuracy

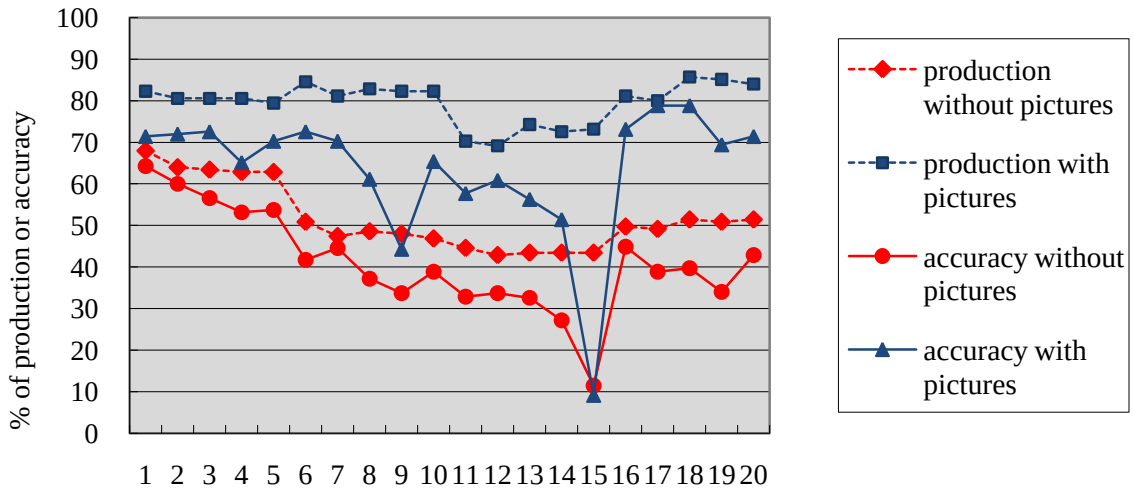
To identify particular parts and syntactic elements that are difficult for L2 Japanese learners to process from aural input, learners' performance on EI was displayed linearly. Figures 4.1, 4.3, 4.5, 4.7 and 4.9 illustrate the average percentage of learners' repetition by sentence type. These figures display production irrespective of accuracy and successfully reproduced sentences. As explained in chapter III, numbers on the X axis correspond to elements in complex sentences. For instance, sentence types a-c include four nouns (corresponding to 1, 6, 11, and 16, respectively), four particles (corresponding to 2, 7, 12, and 17, respectively), four lexical item choices (corresponding to 3, 8, 13, and 18, respectively), four conjugations (corresponding to 4, 9, 14, and 19, respectively), three inflective morphemes (corresponding to 5, 10, and 15, respectively) and a sentence-

[15] Cohen's *d* is a effect size measure. General guidelines for the interpretation of an effect size of *d* are: .20 as small, .50 as medium and .80 as large (Howell, 2007, p. 199).

final predicate (corresponding to 20). The percentages of these aspects are displayed on the Y axis.

Figure 4.1 shows learners' reconstruction of sentence type a. Results clearly show the benefit of pictorial information. Both learners' production and accuracy were better under the with-picture condition than the without-picture condition, except in the 15th position of accuracy. The accuracy of reproducing *-tara* declined sharply at the 15th position, regardless of pictorial support. Learners produced *-tara* accurately 11.4% of time when pictorial information was unavailable, while they produced it accurately 9.4% of time when pictorial information was available. A paired t-test revealed that the difference was not significant (p = .422).

Figure 4.1. Learners' Reconstruction of Sentence Type *a -te, -te, -tara, -masu*



Elements # corresponding to: noun, particle, lexical choice, conjugation, morpheme

Figure 4.2. The Forms That Learners Produced at the Position of *-tara* in Sentence Type *a*

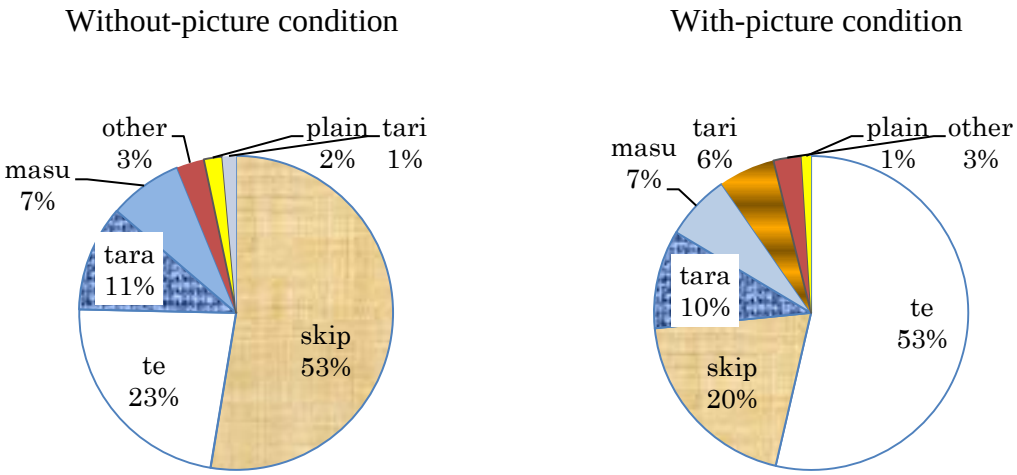
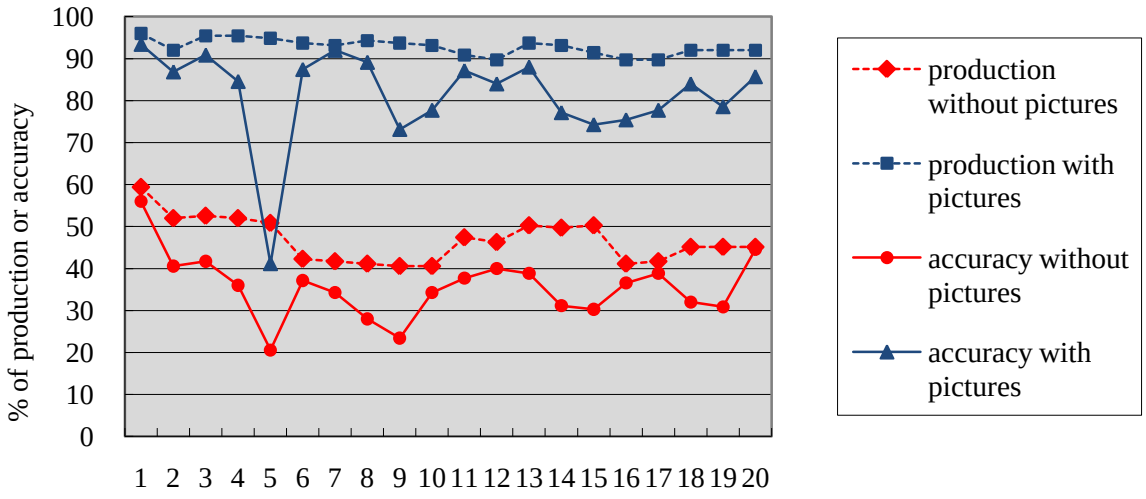


Figure 4.2 shows the percentages of the forms that participants produced at the 15th position in sentence type *a*. *Other* refers to grammatical forms that are not listed in this figure. Under the without-picture condition, learners did not produce anything 53% of the time when they heard the *tara*-form. The most frequently produced form that replaced the *tara*-form was the *te*-form. When learners heard the sequence of *-te, -te, -tara, -masu,* there was a tendency to repeat *-te, -te, -masu* (omitting the *-tara*) or *te, -te, -te, -masu.* Learners produced the correct form only 11% of the time, and only 12 out of 32 learners produced the correct form at least once. Under the with-picture condition, learners replaced *-tara* with *-te* 53% of the time. Similarly to the without-picture condition, when learners heard the sequence of *-te, -te, -tara, -masu,* their most typical reproduction pattern was *te, -te, -te, -masu.* The percentage of accurate reproduction remained at the same level despite the pictorial support.

Figure 4.3 illustrates learners' reconstruction of sentence type *b.* The *?* mark refers to ungrammatical forms. Similarly to sentence type *a*, results show the overall

efficacy of the pictorial effect. Both production and accuracy improved when pictorial information was available to learners. In this sentence type, *-tara* is located at the 5th position. Again, the accuracy of reproduction declined stridently where *-tara* was located. The accuracy of repeating *-tara* was 20.6% under the without-picture condition and 41.1% under the with-picture condition. Unlike the *-tara* form at the 15th position in sentence type *a*, a paired t-test revealed that learners produced it significantly better under the with-picture condition at the 5th position ($p < .001$).

Figure 4.3. Learners' Reconstruction of Sentence Type *b -tara, -te, -te, -masu*



Elements # corresponding to: noun, particle, lexical choice, conjugation, morpheme

Figures 4.4 display percentages of the forms that participants produced at the 5th position in sentence type *b* .Under the without-picture condition, learners skipped reproducing *-tara* nearly half of the time. However, the omission of the *tara*-form occurred only 3% of the time when pictorial information was available.

Figure 4.4. The Forms That Learners Produced at the Position of *-tara* in Sentence Type *b*

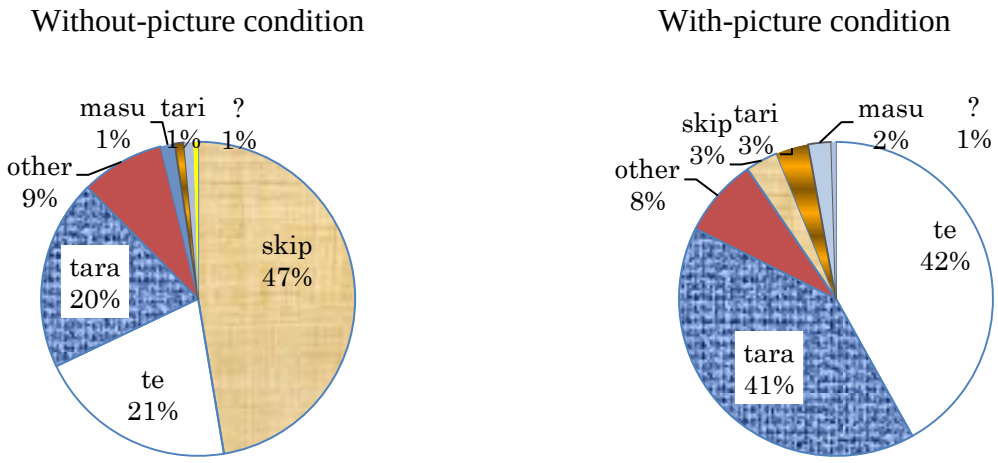
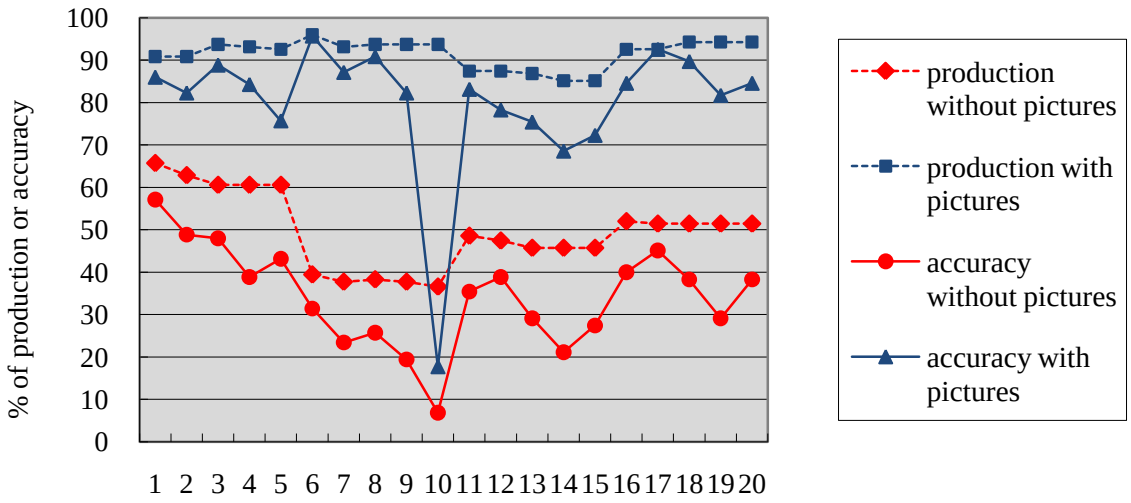


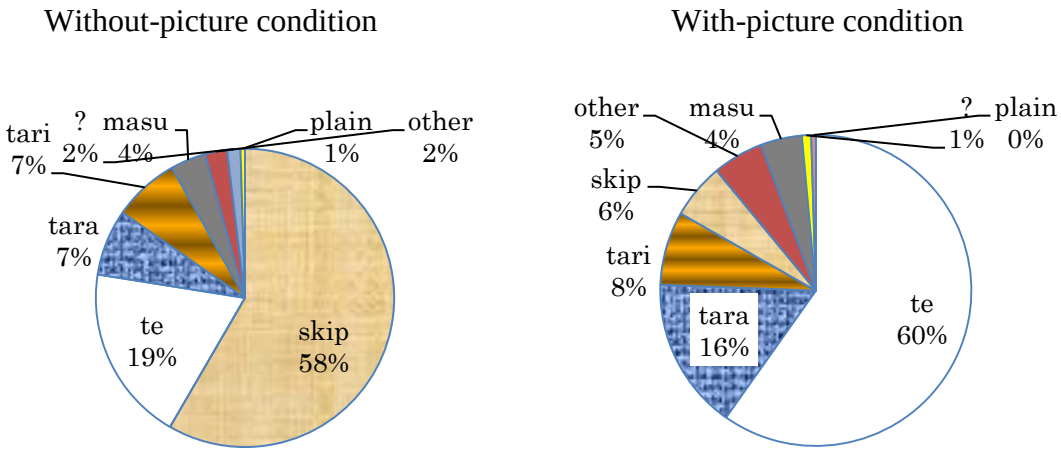
Figure 4.5. Learners' Reconstruction of Sentence Type *c -te, -tara, -te, -masu*



Elements # corresponding to: noun, particle, lexical choice, conjugation, morpheme

Figure 4.5 indicates learners' reconstruction of sentence type *c*, showing the benefits of the pictorial effect. Again, similar to sentence types *a* and *b*, there is an obvious accuracy decline where *-tara* is located. Learners successfully repeated *-tara* 6.9 % of the time under the without-picture condition and 17.7 % under the with-picture condition, respectively. A paired t-test revealed that learners produced the *tara*-form significantly better under the with-picture condition at the 10th position ($p < .001$).

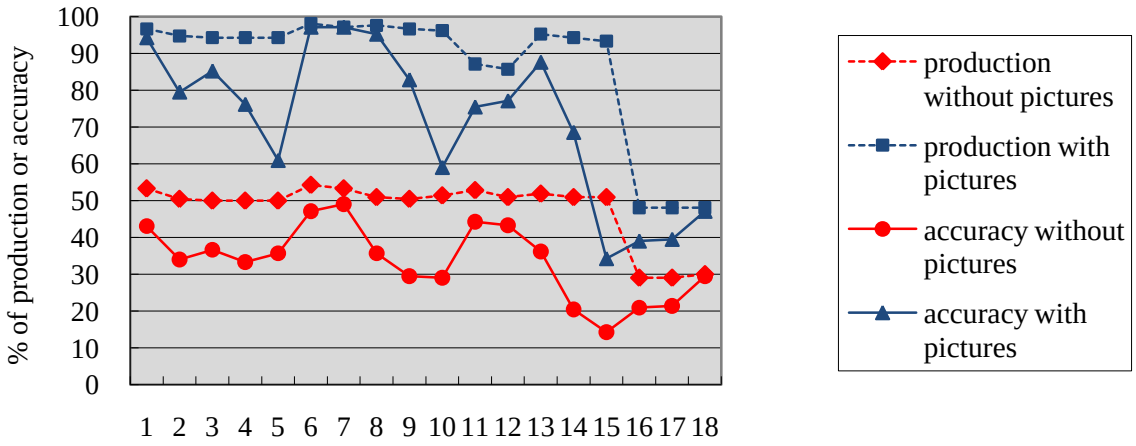
Figure 4.6. The Forms that Learners Produced at the Position of *-tara* in Sentence Type *c*



Percentages of the forms learners produced where the *tara* form was located in the 10th position are shown in Figures 4.6. The distribution of the forms was similar to sentence type *a*. Under the without-picture condition, learners frequently skipped the verb in the *tara* form, which was 58% of the time. When learners heard *-te, -tara, -te, -masu,* there was a tendency to repeat *-te, -te, -masu* (omitting the *-tara*) or *te, -te, -te, -masu,* and this pattern was also similar to sentence type *a*. Learners' performance under the with-picture condition was also very similar to sentence type *a*. The most frequent

reconstruction pattern was *te, -te, -te, -masu*, replacing the second *-tara* with *-te*. The percentage of skipping the *tara*-form decreased sharply from 58% to 6%.

Figure 4.7. Learners' Reconstruction of Sentence Type *d -te, -tari, -tari shimasu*



Elements # corresponding to: noun, particle, lexical choice, conjugation, morpheme

Figure 4.7 indicates learners' repetition of sentence type *d*. Learners' performance under the with-picture condition was constantly better than under the without-picture condition. Unlike sentence types *a-c*, the accuracy of repetition did not improve toward the end of sentences. Both the production and the accuracy of the last *-tari shimasu* 'do things such as' corresponding to positions 15th through 18th turned out to be lower than elements in sentences' initial and medial positions.

Figure 4.8. The Forms that Learners Produced at the Position of the Second -*tari* in Sentence Type *d*

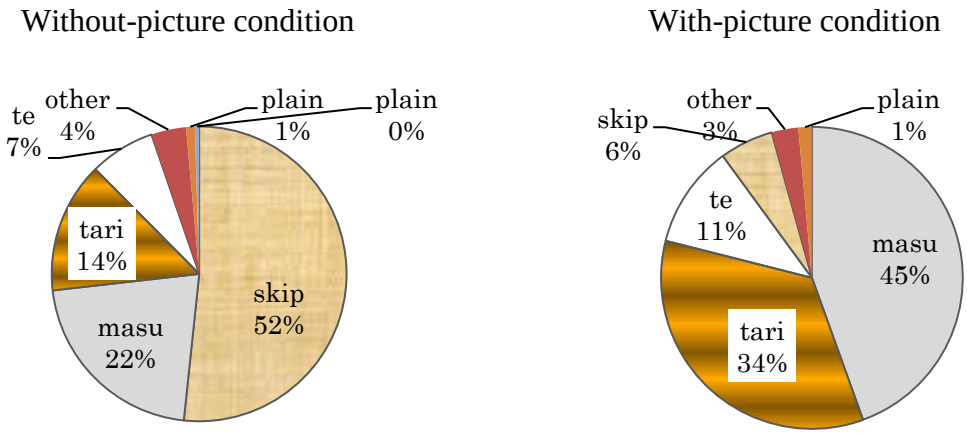


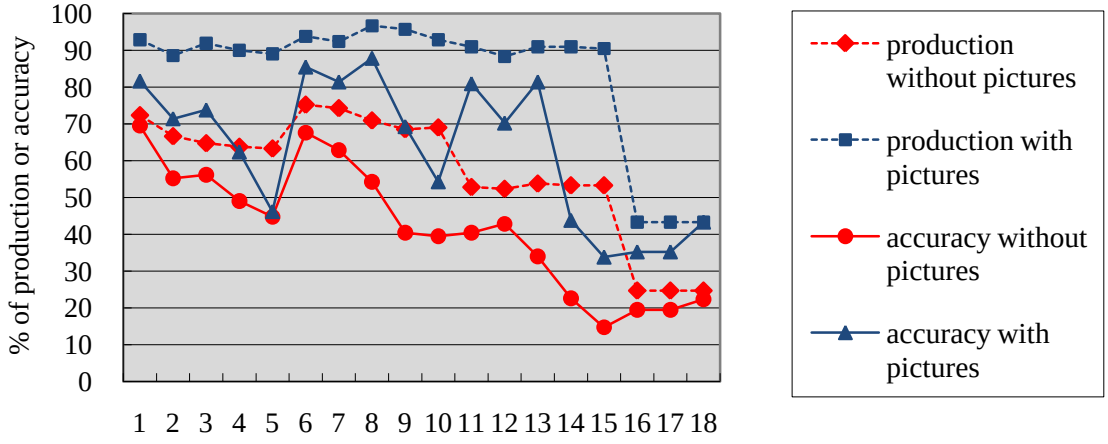
Figure 4.8 indicates the percentages of the forms participants produced when they heard the second -*tari* form in sentence type *d*. The results revealed that participants frequently omitted the second -*tari* and the coordinating verb *shimasu* together under the without-picture condition. The most frequently observed pattern under the with-picture condition was replacement of the second - *tari* with -*masu*. A typical example is as follows.

> Original stimulus:
>
> *Heya ni haitte denwa o kaketari konpuutaa o tsukattari shimasu*.
>
> = (I) enter a room and then do such things as telephone, use a computer, etc.
>
> Learners' repetition:
>
> *Heya ni haitte denwa o kaketari konpuutaa o tsukaimasu*.

Only 16 out of 35 learners produced the second *tari*-form accurately at least once under the without-picture condition. Recognition of the second *tari*-form was difficult for more

than half of the learners; however, with the presence of pictures, the percentage of correctly-reproduced second *tari*-forms increased from 14% to 34%. Learners produced a verb in the *masu*-form 45% of the time instead of *-tari shimasu* when pictorial information was available. Given the fact that *-masu* is a sentence final predicate and thus always located at the end of a sentence, learners' substitution of *-tari shimasu* with *-masu* is predictable.

Figure 4.9. Learners' Reconstruction of Sentence Type *e -tara, -tari, -tari shimasu*



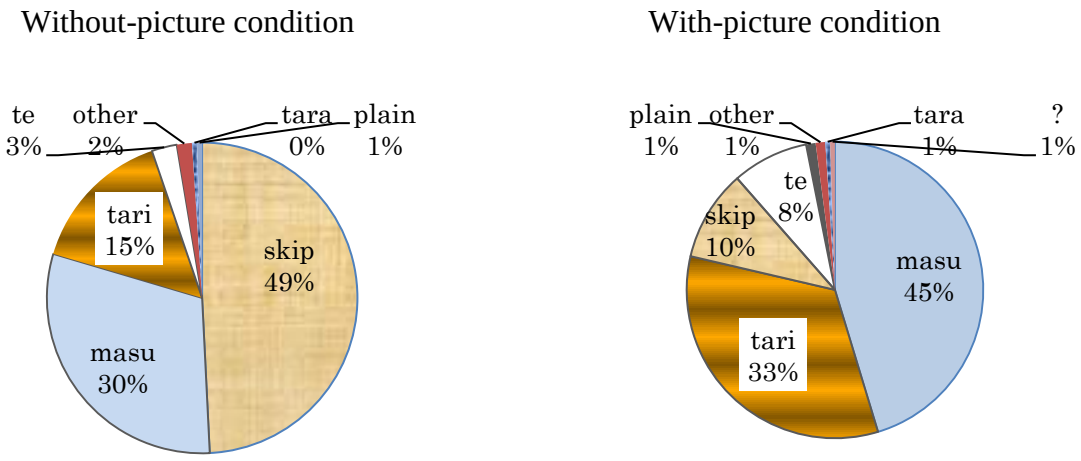
Elements # corresponding to: noun, particle, lexical choice, conjugation, morpheme

Learners' performance on sentence type *e* was different from the hypothesis. In this sentence type, the *tara*-form is located at the 5th position. The study hypothesized that the processing of *-tara* was more difficult than other inflectional morphemes, and learners' performance on sentence types *a-c* confirmed the hypothesis. However, as shown in Figure 4.9, such a trend was not observed under the without-picture support in sentence type *e*. Learners processed *-tara* better than *-tari* at the 10th or at the 15th

position. The accuracy rates of processing *-tara* were 44.8% and 46.2% under the without-picture and with-picture conditions respectively. In sentence type *e*, pictorial support did not contribute to the accurate reconstruction of the *tara*-form.

Figure 4.10 presents percentages of the forms learners produced when they heard the second *-tari* form in sentence type *e*. Similarly to sentence type *d*, learners exhibited an obvious tendency to omit the second *-tari* and the coordinating verb *shimasu* together under the without-picture condition, and this omission occurred 49% of the time. Under the with-picture condition, replacement of the second *-tari* with *-masu* occurred most frequently, 45% of the time. The results of learners' performances on both sentence types *d* and *e* suggest that their difficulty recognizing *-tari shimasu* 'do things like…'persists regardless of the presence of pictorial information.

Figure 4.10. The Forms That Learners Produced at the Position of the Second *-tari* in Sentence Type *e*



Summary of Learners' Production and Accuracy

Visual displays of learners' production and accuracy indicate the following trends. First, learners' production with pictorial support was consistently better than it was without pictorial support. Similarly, accuracy of production was also consistently better with pictorial support. However, two exceptions were found where the effect of pictorial support was not observed. There was no statistical difference between with-picture and without-picture conditions when learners heard the inflective morpheme *-tara* located at the 15th position in sentence type *a* and at the 5th position in sentence type *e*. Possible reasons for these exceptions are discussed in the following chapter.

Reconstruction of Syntactic Elements

Comparisons of Nouns, Particles, Lexical Choices, Conjugations and Inflective Morphemes

The second research question intends to find syntactic elements that are particularly difficult to reconstruct for L2 Japanese learners. Elements in the first three VPs were analyzed to find particular syntactic elements that prove difficult for L2 learners to reconstruct. As mentioned in the previous section, the last VP in sentence types *a-c* and the coordinating verb in sentence types *d* and *e* do not include the three types of inflective morphemes with which this study is primarily concerned; thus, these parts are excluded from this analysis. A two-way ANOVA revealed a significant Elements effect, $F(4, 340) = 37.33$, $p < .001$, $\eta^2_p = .305$, and a significant interaction for Pictorial Support x Elements, $F(4, 340) = 4.67$, $p = .001$, $\eta^2_p = 052$. Table 4.3 shows the results of multiple comparisons of syntactic elements using Bonferroni. Inflective morphemes were significantly more difficult than all other components, and conjugations were significantly more difficult than nouns, particles and lexical choices.

Table 4.3. Multiple Comparisons of Accuracy Between Elements

	Nouns	Particles	Lexical Choices	Conjugations	Inflective Morphemes
Noun	---	not sig.	not sig.	$p < .001$	$p < .001$
Particles		---	not sig.	$p < .001$	$p < .001$
Lexical Choices			---	$p < .001$	$p < .001$
Conjugations				---	$p < .001$
Inflective Morphemes					---

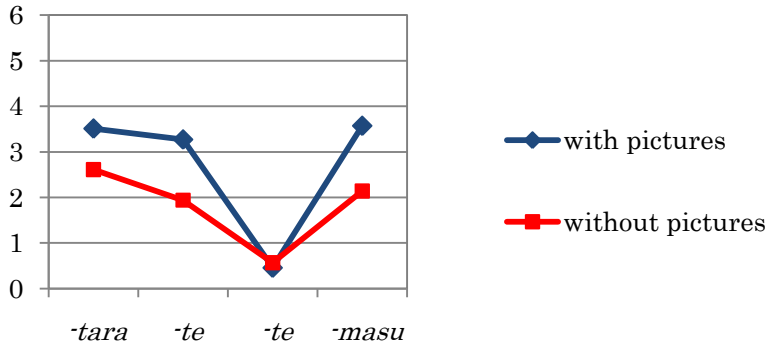
Comparisons of Inflective Morphemes at Different Locations in a Sentence

This study concerns the influence of two particular factors regarding inflective morphemes: their placement within a sentence and the length of students' exposure to the grammatical concept. Learners' length of exposure to target inflective morphemes ranges from half a semester to more than two semesters. Thus, differing lengths of exposure may create a different cognitive load and, as a result, the pictorial-support effect may differ depending on the inflective morpheme. Additionally, as the literature suggests, locations within a sentence impose a differential cognitive load on learners. To investigate the effect of pictorial support on the reconstruction of inflective morphemes at different locations, two-way ANOVAs were conducted by sentence types. Sentence-final predicate *-masu* was included this analysis for a comparison to inflective morphemes.

Regarding sentence type *a* (*-te -te -**tara** -masu*), results revealed a main effect for both Pictures $F(1, 272) = 31.84$, $p < .001$, $\eta^2_p = .105$, and Morphemes $F(3, 272) = 59.60$, p

< .001, η^2_p = .397. There was also a significant Picture X Morphemes interaction, $F(3, 272) = 5.26$, $p = .002$, $\eta^2_p = .055$. Figure 4.11 shows the mean number of learners' accurate reproduction of inflective morphemes and the sentence final predicate *-masu*. As explained in the previous chapter, all sentence types have 12 sentences, and half of them are accompanied by pictures; thus, the highest possible number is 6. The figure shows an obviously poor performance with *-tara* at the 15th position in the stimuli. Bonferroni multiple comparisons indicate that there is a significant difference between *-tara* and other inflective morphemes at the 5th and 10th positions ($p < .001$). Another significant difference was found between *-tara* and a sentence final predicate *-masu* at the 20th positions ($p < .001$). Thus, the significant morpheme effect is attributable to the difficulty of processing *-tara* at the 15th position.

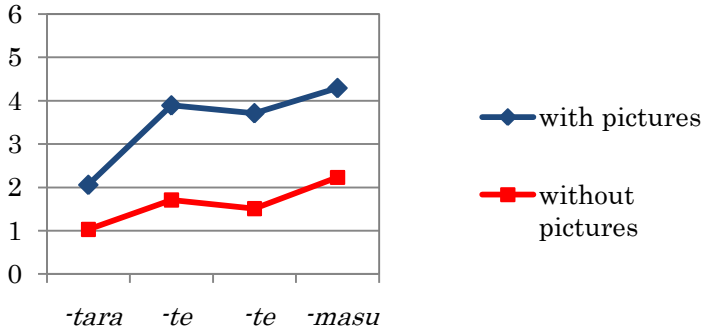
Figure 4.11. Mean Number of Accurately Produced Forms, Sentence Type *a*



As for sentence type *b* (***-tara*** *-te -te -masu*), a two-way ANOVA revealed that there were main effects for both Pictures $F(1, 272) = 155.80$, $p < .001$, $\eta^2_p = .364$, and Morphemes $F(3, 272) = 23.62$, $p < .001$, $\eta^2_p = .207$. There was also a significant Picture

X Morphemes interaction, $F(3, 272) = 3.52$, $p = .016$, $\eta^2_p = .037$. Figure 4.12 illustrates the mean number of accurate inflective morphemes. Bonferroni multiple comparisons indicate that there is a significant difference between *-tara* and other inflective morphemes at 10th and 15th ($p < .001$). There is also a significant difference between *-tara* and a sentence-final predicate *-masu* at the 20th positions ($p < .001$). Another significant difference is found between *-te* at the 15th position and a sentence-final predicate *-masu* at the 20th position ($p = .015$). The significant morpheme effect is mainly attributable to the difficulty of processing *-tara* at the 5th position.

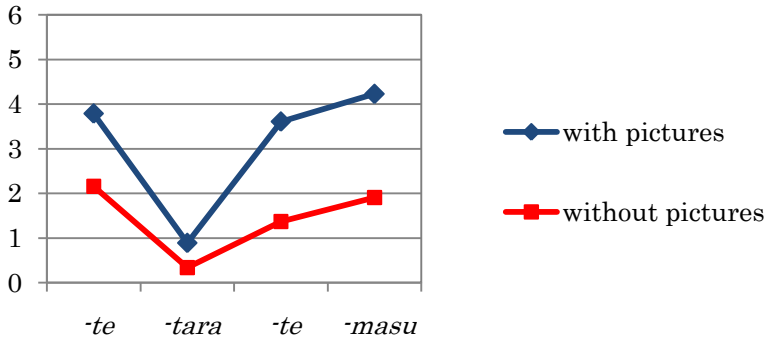
Figure 4.12. Mean Number of Accurately Produced Forms, Sentence Type *b*



Regarding sentence type *c* (*-te* ***-tara*** *-te -masu*), a two-way ANOVA revealed that there were main effects for both Pictures $F(1, 272) = 149.83$, $p < .001$, $\eta^2_p = .355$, and Morphemes, $F(3, 272) = 69.26$, $p < .001$, $\eta^2_p = .355$. There was also a significant Picture x Morphemes interaction, $F(3, 272) = 8.89$, $p = .001$, $\eta^2_p = .089$. Figure 4.13 illustrates the mean number of accurate inflective morphemes. Bonferroni multiple comparisons reveal a significant difference between *-tara* and other inflective morphemes at 5th and 15th ($p < .001$). Additionally, there is also a significant difference between *-tara* and a sentence-

final predicate *-masu* ($p < .001$). Another significant difference is found between *-te* at the 15th position and the sentence final predicate *-masu* ($p = .019$). Similarly to sentence types *a* and *b*, the significant morpheme effect is mainly attributable to the difficulty of processing *-tara* located at the 10th position in sentence type *c*.

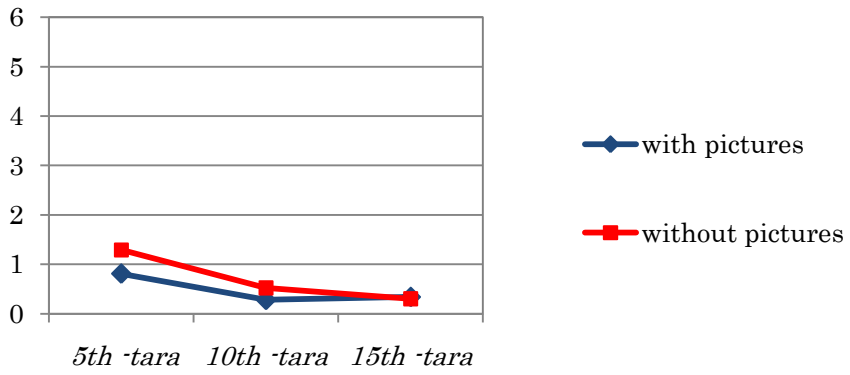
Figure 4.13. Mean Number of Accurately Produced Forms, Sentence Type *c*



To track the influence of the location of *-tara* in sentence types *a*, *b* and *c* on the difficulty of reproduction, a two-way ANOVA was conducted. The independent variable was Picture, and the dependent variable was Location. Figure 4.14 illustrates the mean number of accurately produced *-tara* at different locations. As already mentioned, *-tara* was located at the 15th position in sentence type *a*, at the 5th position in sentence type *b*, and the 10th position in sentence type *c*. Results indicated that there were main effects for both Picture, $F(1, 204) = 11.79$, $p = .001$, $\eta^2_p = .055$ and Location, $F= 19.87$ (2, 204), $p < .001$, $\eta^2_p = .163$. There was also an interaction Picture x Location, $F= 6.18$ (2, 204), $p = .002$, $\eta^2_p = .057$. Bonferroni multiple comparisons revealed that learners produced *-tara* at the 5th position significantly better than those located at either the 10th position (*p*

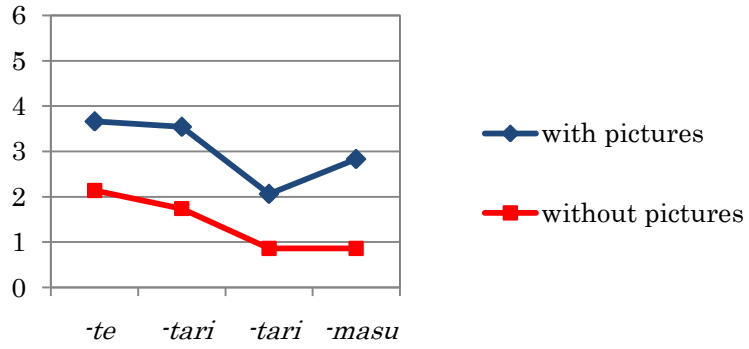
< .001) or the 15th position ($p < .001$). However, no significant difference was found between *-tara* at the 10th and 15th positions.

Figure 4.14. Mean Number of the Accurately Produced *tara*-Form at Different Positions in Sentences



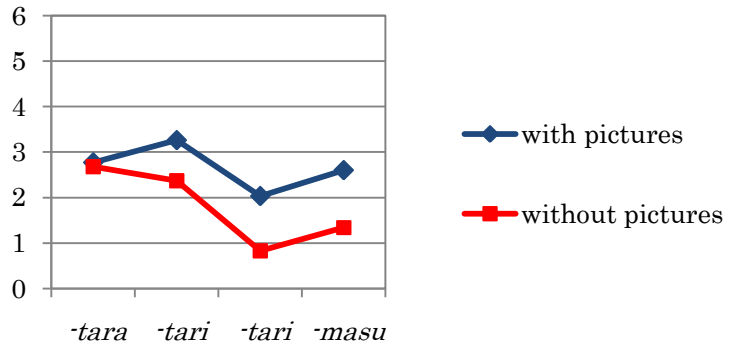
Sentence type *d* includes two *-tari* that expresses an inexhaustive listing of actions. A two-way ANOVA revealed that there were main effects for both Pictures, $F(1, 272) = 64.10$, $p < .001$, $\eta^2_p = .190$, and Morphemes, $F(3, 272) = 11.09$, $p < .001$, $\eta^2_p = .109$, but no interaction was found. Figure 4.15 displays the mean number of accurately produced morphemes. Bonferroni multiple comparisons revealed that *-tari* at the 15th position was significantly more difficult than *-te* at the 5th position ($p < .001$) and *-tari* at the 10th position ($p < .001$). Similarly, *-masu* at the 18th position was significantly more difficult than *-te* at the 5th position ($p = .002$) and *-tari* at the 10th position ($p < .034$). No significant difference is found between *-tari* at the 15th position and a sentence-final predicate *-masu* at the 18th position.

Figure 4.15. Mean Number of Accurately Produced Forms, Sentence Type *d*



Sentence type *e* also includes two *-tari* and the difference between types *d* and *e* is the inflective morpheme at the 5th position. Figure 4.16 shows the mean number of accurately produced forms in sentence type *e*. A two-way ANOVA revealed that there were main effects for both Pictures, $F(1, 272) = 16.76$, $p < .001$, $\eta^2 p = .058$, and Morphemes, $F(3, 272) = 9.88$, $p < .001$, $\eta^2_p = .098$. As in sentence type *d*, there is no interaction. Bonferroni multiple comparisons showed significant differences between *-tara* at the 5th position and *-tari* at the 15th position ($p < .001$), between *-tari* at the 10th position and *-tari* at the 15th position ($p < .001$), and between *-tari* at the 10th position and the sentence final predicate *-masu* at the 18th position ($p = .029$). Again, similar to sentence type *d*, no significant difference is found between *-tari* at the 15th position and the sentence final predicate *-masu*.

Figure 4.16. Mean Number of Accurately Produced Forms, Sentence Type *e*

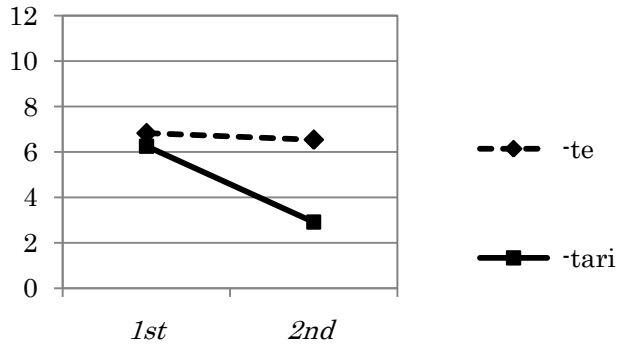


Finally, the current study examined whether the difficulty of reconstructing the *te*-forms in sentence type *b* (*-tara -te -te*) differs from that of reconstructing the *tari*-forms in sentence type *e* (*-tara -tari -tari*). The current study hypothesized that more frequently exposed forms were easier for L2 learners to reconstruct than infrequently exposed forms. Learners had been exposed to the *te*-form twice as long as the *tari*-form in the classroom. Therefore, it was expected that the reconstruction of *-te -te* in sentence type *b* would be better than *-tari -tari* in sentence type *e.* Descriptive statistics found that the mean score for the first-*te* form was 6.83 points and the first *-tari* form was 6.25 points. There was a large gap between the mean scores for the second *-te* form and the second *-tari* form, 6.54 points and 2.91 points, respectively.

To examine the influence of locations on the production of these two inflective morphemes, another two-way ANOVA was conducted. The results of a 2 x 2 factorial analyses revealed a significant main effect for Form, $F(1, 136) = 14.31$, $p < .001$, $\eta^2 p = .095$, and for Location, $F(1, 136) = 25.76$, $p < .001$, $\eta^2 p = .159$. There was a significant interaction for Form x Location, $F(1, 136) = 14.31$, $p < .001$, $\eta^2 p = .095$. Figure 4.17 shows these results. This analysis found that the *tari*-form was significantly more

difficult to produce than the *te*-form. The difference was due to the *-tari* form's sensitivity to location.

Figure 4.17. Mean Number of Accurately Produced Forms, Comparison of *-te -te* in Sentence Type *b* and *-tari –tari in* Sentence Type *e*



Summary of Inflective Morphemes

This section compared learners' reconstruction of three types of inflectional morphemes. One of the main objectives was to examine the effect of learners' length of exposure to inflectional morphemes. The current study hypothesized that learners process forms to which they have been frequently exposed better than forms to which they have had less frequent exposure. Thus, the order of successful reconstruction would be the *te*-form > the *tari*-form > the *tara*-form according to the length of exposure to each form in class. The results partially confirmed the hypothesis. As hypothesized, the inflective morpheme *-tara,* to which learners of this study had been exposed for half a semester, was significantly more difficult to process than the inflective morpheme *-te,* to which learners had been exposed for more than two semesters. The differences in processing

these two inflective morphemes were observed in sentence types *a*-*c*. Learners' performance on sentence type *e* did not confirm the hypothesis. The length of exposure to inflectional morphemes did not explain why learners reconstructed -*tara* better than -*tari.*

The second main objective of the comparisons was to find the effect of location in a sentence. The basic assumption is that perceptual salience of an inflectional morpheme decreases as its location gets closer to a sentence-internal position. Therefore, the study hypothesized that learners' successful reconstruction of inflectional morphemes differs depending on their location in a sentence. Again, the hypothesis was partially confirmed. Learners' performance on sentence types *a*-*c* exhibited that reconstruction of the *tara*-form was seriously affected by its location in a sentence. Learners' reconstruction of the *te*-form was not as heavily affected by its location. However, it was also affected when the *te*-form was close to the end of a sentence, as shown in sentence type *c*. Learners' performance on sentence types *d* and *e* indicates that morphemes that were close to the end of a sentence were not necessarily well reproduced. In fact, learners' reconstruction of -*tari shimasu* 'do things such as…' in sentence types *d* and *e* was poor, despite its sentence-final position.

Reproduction of Particles by Clause Types

There are multiple possibilities that may account for the difficulty of reconstructing inflective morphemes, particularly -*tara* in sentence types *a*-*c*. Learners' recognition of clauses may be one such possibility. The *tara*-form constitutes a subordinate clause, while the *te*-form and the *tari*-form are coordinate clauses. To correctly understand the meaning of the *tara*-form, a learner must be able to identify a main clause and a subordinate clause in a complex sentence. In Japanese, a particle is an important cue for finding relationships between a noun and a verb within a clause. If subordination causes processing difficulties for learners, they not only fail to process the *tara*-form but also other elements within a clause, including particles.

To verify the influence of subordination to the processing of particles, this study compared learners' reconstruction of particles in coordinate and subordinate clauses. All stimuli except sentence type *d* have a subordinate clause and at least two coordinate clauses. The contrast made for this analysis is as follows: [+1] * [the average score of particles in a subordinate clause] versus [-1/2] * [the average score of particles in the first coordinate clause] + [-1/2] * [average score of particles in the second coordinate clause]. Sentence type *d* does not include a subordinate clause, so the contrast was made to compare particles in two different types of coordinate clauses.

Table 4.4 indicates the results of planned comparisons. Regarding particles in sentence types *a*-*c*, learners produced particles located in sentence-initial position more accurately than those located in sentence-internal or in sentence-final position. If the difficulty of the *tara*-form was attributable to subordination, contrasts in sentence types *b* and *e* would indicate that the production of particles in the -*tara* clause is more difficult than those in the -*te* or -*tari* clause. However, such a tendency was not observed. Under the same logic, there should be no significant difference in the difficulty of reproducing particles in sentence type *d*, as all particles are located in coordinate clauses. Yet the results revealed that reconstruction of particles in -*tari* clauses was significantly more difficult than in -*te* clauses. Furthermore, particles in the second -*tari* clause were significantly more difficult to reconstruct than those in the first -*tari* clause.

Table 4.4. Planned Comparison of Particle Reproduction by Clause type

Contrasts	Contrast Tests Results
a. 3rd clause -*tara* vs 1st and *2*nd clause -*te*	Without Pictures: p <.001 *** With Pictures p =.04 *
b. 1st clause -*tara* vs *2*nd and 3rd clause -*te*	Without Pictures: p=.561 With Pictures: p =.70
c. *2*nd clause -*tara* vs 1st and 3rd clause -*te*	Without Pictures: p <.001 *** With Pictures: p =.226
d. 1st clause -*te* vs *2*nd and 3rd clause -*tari*	Without Pictures p =.025 * With Pictures p =.01 **
e. 1st clause -*tara* vs 1st and *2*nd clause -*tari*	Without Pictures: p=.647 With Pictures: p =.234

Note: * significant at α= .05 ** significant at α= .01 *** significant at α= .001

Under the without-picture condition, the average score of particles in the first -*tari* clause was 2.94 points while the average score in the second -*tari* clause was 2.60 points. A paired t-test revealed that the difference was not significant (t = 1.46, p =.154). Under the with-picture condition, the average score of particles in the first and second -*tari* clause was 5.83 and 4.63 points respectively, and this difference was significant (t = 11.9, p <.001).

These planned comparisons showed a general tendency for learners' reconstruction of particles to decline when a clause was located in a sentence-internal position without pictorial information. The current study did not find evidence for the influence of subordination on L2 learners' reproduction of particles.

Effects of Repetition During the Experiment

The Noticing Hypothesis claims that frequency in input contributes to learners' recognition of target items (Schmidt, 1990, 2001). However, the effect of frequency remains controversial in the realm of SLA, as adult L2 learners in general do not have enough opportunities to be exposed to the target language. Against such a controversy, the current study argues that L2 learners also benefit from a frequency-based approach under certain conditions. If L2 learners have basic knowledge about a structure, they are capable of retrieving it solely by being exposed to input many times. L2 learners in the current study had received explicit instruction about structures in stimuli prior to the experiment. Thus, this experiment may provide learners with a positive practice effect. If so, the results of the current study may offer some evidence that effectiveness of frequency-based learning is also applicable to L2 learners.

To examine the effect of short-term frequent input on L2 learners' reconstruction of a complex sentence, the current study compared the accuracy of the first 10 and last 10 sentences learners reconstructed from stimuli. The portion of the stimuli that did not include an inflective morpheme was excluded from analysis; thus, the results reflected elements in the first three VPs. The first 10 and last 10 sentences consisted of five types of sentences under the with-picture and without-picture conditions. Each VP consisted of five syntactic elements, so if a learner was able to reconstruct all the elements, that learner earned 150 points (10 sentences x 3 VPs x 5 elements). Descriptive analysis found that learners' performance during the first 10 sentences ranged from 28 to 118 points. For the last 10 sentences, the score ranged from 50 points to129 points.

Table 4.5 shows the mean number of each element learners reconstructed from the first and last 10 stimuli. Paired t-tests found that learners produced all elements significantly better in the last 10 sentences more than in the first 10 sentences ($p < .001$). Cohen's d for each element was 0.93 for noun, 0.79 for particle, 1.27 for lexical choice, 0.59 for conjugation and 0.86 for inflective morpheme. Among five elements, the effect

of repetition was the greatest for the reconstruction of lexical choice. A two-way ANOVA was performed for statistical analysis. The results show a main effect for Elements, $F(4, 340) = 27.01$, $p < .001$, $\eta^2_p = .241$, and First versus Last, $F(1, 340) = 52.55$, $p < .001$, $\eta^2_p = .134$. There was no interaction, $F(4, 340) = .20$, $p = .938$, $\eta^2_p = .002$.

Table 4.5. Descriptive Statistics for Learners Reproduction in the First and Last 10 Sentences by Elements (n=35)

	Noun		Particle		Lexical Choice		Conjugation		Inflective Morpheme	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD	Mean	STD
First 10	17.59	3.89	16.74	4.43	16.36	4.20	13.70	4.55	10.71	4.03
Last 10	21.11	3.66	20.37	4.73	19.51	4.36	16.50	4.84	14.76	5.31

Figure 4.18. Mean Number of Reproduced Elements in the First and Last 10 Sentences

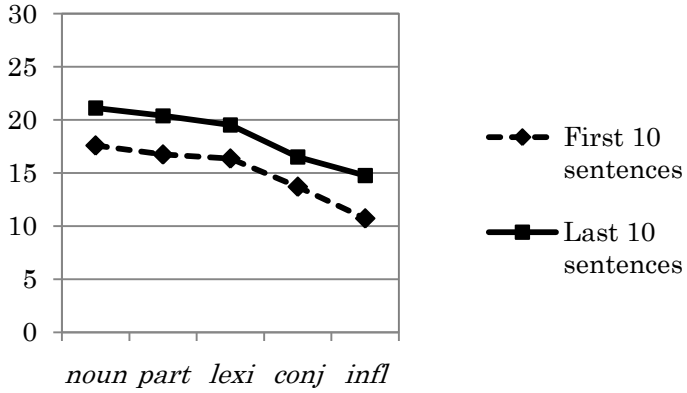


Figure 4.18 illustrates the mean number of elements learners produced in the first and last 10 sentences. As seen in Figure 4.18, learners made improvements in all the elements. Most learners spent approximately 20 minutes on the experiment; thus, approximately 20 minutes of intensive repetition led to a significant improvement in the reconstruction of complex sentences. Nouns were the easiest and inflective morphemes were the most difficult to reconstruct, both in the beginning and the end of the experiment.

In sum, the comparison of learners' performance during the first 10 and the last 10 stimuli revealed that learners' performance had significantly improved solely by hearing and repeating complex sentences for approximately 20 minutes.

Learners' Performance on EI and the Proficiency Test

Contribution of Receptive Proficiency to EI Performance

EI is a technique that examines learners' linguistic competence based on their working memory. The current study assumes that more proficient learners exhibit more solid performances in EI than less proficient learners, as the literature has found that learners' performance on EI and their proficiency were highly correlated (Erlam, 2006; Graham et al., 2008; Henning, 1983). Multiple regression analysis was performed to analyze whether learners' performance on the Japanese proficiency test accounts for their performance on EI. Learners' performance on the listening, vocabulary, and grammar sections of the proficiency test are used as predictors. The dependent variable was learners' scores on EI.

Stepwise multiple regression revealed R square .65 (Adjusted R square .628) when independent variables are listening and grammar, indicating that the combination of scores on listening and grammar accounts for 65% of EI scores. An ANOVA indicates that the model value of F (2, 31) =28.83, $p < .001$. The results suggest that this model significantly contributes to the ability to predict learners' performance on EI. As shown in Table 4.6, both listening and grammar scores are significant predictors of EI

performance. The model excluded vocabulary from prediction (t = -.867, p =.393). The low contribution of vocabulary to the EI score was anticipated because lexical items in EI were controlled for difficulty so they would not affect learners' processing of syntactic elements. Pearson correlations indicate a correlation between EI and listening of .74, between EI and grammar of .64, and between EI and vocabulary of .42.

Table 4.6. Multiple Regression Model Summary for EI and the Japanese Proficiency Test (n = 34)

	b	SE*b*	*β*	*t*	*p*
(Constant)	260.77	56.93		4.58	.000
Listening	3.18	.69	.56	4.64	.000
Grammar	1.65	.54	.37	3.07	.004

Contribution of Syntactic Elements to the Prediction of Receptive Proficiency

To answer the question regarding specific syntactic elements that contribute to the prediction of L2 learners' receptive proficiency, this study performed another multiple regression. Predictors were learners' EI performance on five syntactic elements. The dependent variable was the total score on the Japanese Proficient Test. Table 4.7 displays the results of Pearson correlations. All elements except nouns are highly correlated to the proficiency test score. In Japanese, verb conjugation is delivered according to three verb types: (a) irregular verbs, (b) regular verbs that end with -*u*, and (c) regular verbs that end

with either *-iru* or *-eru*. Learners first need to identify the verb type and then change the form according to the conjugation rules applicable to each inflective morpheme. Therefore, it is reasonable to expect a high correlation between verb choice and conjugation and also between conjugation and inflective morpheme.

Table 4.7. Correlations Among Elements and Proficiency Test (n=34)

	Proficiency Test Score	Noun	Particle	Verb Choice	Conju.	Inflective Morpheme
Proficiency Test Score	---	.630	.711	.764	.785	.726
Noun		---	.949	.897	.834	.823
Particle			---	.919	.870	.850
Lexical Choice				---	.977	.954
Conju.					---	.954
Inflective Morpheme						---

Stepwise regression reveals that conjugation alone is the best predictor of proficiency, R square = .616, adjusted R square = .604. All other variables are removed from the prediction model. Thus, learners' ability to reconstruct conjugation alone accounts for 61.6% of their receptive proficiency. An ANOVA shows that the contribution of the model is significant, $F(1, 32) = 51.32$, $p < .001$.

Contribution of Pictorial Support to the Prediction of Receptive Proficiency

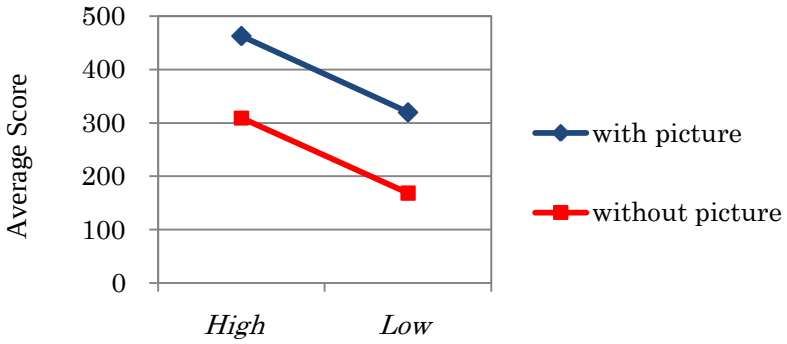
Finally, the relationship between learners' receptive proficiency and their ability to utilize pictorial information was analyzed. Predictors were learners' EI scores under the without-picture condition and under the with-picture condition; the dependent variable was the proficiency test score. Multiple regression analysis revealed that R square for learners' reproduction in the without-picture condition was .502. R square was .577 for the combination of learners' reproduction in the with-picture and without-picture conditions. An ANOVA showed that both models were significant predictors of learners' proficiency: $F(1, 32) = 32.193$ ($p < .001$) for the without-picture condition, and $F(1, 32) = 21.10$ ($p < .001$) for the with-picture condition.

To examine whether learners' EI score improvement due to pictorial information support (without-picture scores deducted from with-picture scores) relates to their proficiency level, this study performed a simple regression, with EI gain as a predictor and the proficiency test score as a dependent variable. The current study predicted that the effect of pictorial support would be different depending on learners' proficiency, assuming that high proficiency learners had more attentional resources than low-proficiency learners. Therefore, low-proficiency learners who did not possess enough attentional resources would benefit more from additional support than would high-proficiency learners (Blau, 1990). The results of simple regression revealed that EI gain did not account for learners' performance on the proficiency test, R square = .010 and adjusted R square = -.021. An ANOVA indicates that the contribution of EI score gain to proficiency test performance is non-significant ($p = .575$). These results suggest that learners' receptive proficiency and their ability to utilize pictorial information do not have a linear relationship. In other words, regardless of proficiency, all learners benefit from the presence of pictorial information.

To further examine whether learners' ability to utilize pictorial information contributes to their receptive proficiency, the current study performed a 2 x 2 two-way ANOVA. The factor was proficiency, consisting of high-proficiency and low-proficiency groups, and the dependent variables were each group's without-picture EI scores and with-picture EI scores. Prior to performing this analysis, it was necessary to identify high- and low-proficiency learners among participants. The current study adopted the same pass/fail criterion from the original proficiency test to make a decision about the proficiency-based grouping. In the official proficiency test, test-takers who earn more than 60% correct answers pass Level 3. This study also chose the 60% passing mark to distinguish high-proficiency and low-proficiency learners from those who are in the middle. To determine the scores that are either significantly higher or lower than the 60% passing mark, this study adopted a 90% confidence interval from a binomial distribution. Participants who fell outside the 90% confidence interval were considered to be either significantly better or worse than the average participants. The upper end of the 90% confident interval (centering around 60%) is 74%, and the lower end is 46%. Six students who earned higher than 74% of the entire score were included in the high-proficiency group. Likewise, eight students who earned less than 46% of the entire score formed the low-proficiency group.

An F-max test revealed that the variance in each group was not significantly different; thus, a two-way ANOVA was performed regardless of the unequal number of participants in each group. The results revealed that there was a main effect for Proficiency, $F(1,24) = 28.6$, $p < .001$ and Pictorial Support, $F(1,24) = 33.20$, $p < .001$. However, there was no interaction, $F(1, 24) = .002$, $p = .96$, as shown in Figure 4.19. The results add support to the finding that learners benefit from pictorial support regardless of their proficiency.

Figure 4.19. Learners' Performance in With-Picture and Without-Picture Conditions by Proficiency Group



Summary of Chapter IV

The first facet of the research question investigated here asks whether visualized chunks promote the reconstruction of a complex sentence from aural input. The current study predicted that learners' WM capacity would not suffer much when visualized chunks were available. Therefore, learners' performance would improve when pictorial support was available. To confirm this hypothesis, the current study illustrated learners' performance by using horizontal serial lines. The fluctuations of a line indicated specific locations in a complex sentence where learners struggled with processing.

The results of statistical analyses found an overall significant effect of pictorial support. Thus, the first hypothesis of the current study was confirmed. However, there were two instances in the entire stimuli in which pictorial information did not enhance learners' reconstruction at a statistically significant level. These instances were observed where the *tara*-form was located. The current study found that the effect of pictorial support differed depending on syntactic elements and location in a complex sentence.

These findings led to the second research question concerning syntactic elements that are particularly challenging for L2 learners of Japanese to produce from aural input. The current study hypothesized that inflective morphemes would be the most difficult to

reproduce in comparison with other syntactic elements, due to their low salience in the input (Bates & Goodman, 1997; N. Ellis, 2008; Slobin, 1985). It also hypothesized that the order of successful reconstruction among three target structures of inflective morphemes would be *-te* > *-tari* > *-tara*, according to the length of learners' exposure to these morphemes in class.

The results of statistical analyses confirmed the hypothesis that inflective morphemes were significantly more difficult to reconstruct compared to all other elements. The results also found that conjugations were significantly more difficult than nouns, particles and verb lexical choices. The results of comparisons among inflective morphemes were mixed. As predicted, the *tara*-form was significantly more difficult to reconstruct than the *te*-form in sentence types *a, b* and *c*. On the other hand, the difficulty order of *-te* < *-tari* was not confirmed in sentence type *d*, since no statistical difference was found between the *te*-form and the first *tari*-form. The difficulty order of *-tari* < *-tara* was not confirmed in sentence type *e*, as the *tara* at the 5th position was produced significantly better than *-tari* at the 15th position.

In sum, regarding the second research question, the current study revealed the following results. First, perceptual salience influences L2 learners' reconstruction. Inflective morphemes and conjugation are low in salience (both are a part of a verb that constantly changes shapes), and learners' reconstruction of these two elements was weaker than other elements. Second, location of an item influences L2 learners' reconstruction. In particular, L2 learners' reconstruction is severely affected if an unfamiliar item is located in a low-salience position. Generally, an item located closer to the beginning or to the end of a sentence is more salient than an item located in the middle of a sentence. Third, salience in location diminishes if the meaning of an item does not influence the interpretation of the entire sentence. This can be seen in the example of *shimasu* 'to do', which is a part of *-tari shimasu* 'do things such as…' structure.

From the analysis of learners' performance, the effect of length of exposure to forms was unclear. Learners' performance indicates that accuracy of the same inflectional morpheme differs depending on the location in a sentence, and the length of exposure in class alone cannot explain the differences. The current study suggests that L2 learners' successful reconstruction of inflectional morphemes is more influenced by their position in a sentence rather than by length of exposure in class. The following chapter offers detailed discussion of salience and length of exposure.

The final facet of the research dealt with the prediction of individuals' receptive L2 competence. The current study hypothesized that L2 learners' performance on EI was a reliable predictor of proficiency, as learners with high WM load were better able to reconstruct sentences from aural input. Such learners were able to reconstruct syntactic elements that are low in salience. Therefore, successful repetition of inflective morphemes was a reliable indicator of receptive L2 proficiency. The current study also hypothesized that dual modal support would reveal individual differences, assuming that learners who suffer from cognitive overload would benefit more from dual modal support than high proficiency learners. The results support the hypothesis that learners' performance on EI is a reliable predictor of their receptive proficiency. Inflective morphemes were found to be a reliable indicator of receptive L2 proficiency. However, conjugation was the best predictor of proficiency. Regarding dual modal support and L2 learners' proficiency, the results did not confirm the hypothesis. All of the L2 learners who participated in the current study benefited from dual modality, regardless of their proficiency.

The following chapter will discuss possible reasons that can account for the results, as well as study limitations, pedagogical implications and a potential future direction for the current study.

CHAPTER V

DISCUSSION

Introduction

The main purpose of the current study was to investigate whether L2 learners' ability to reconstruct complex sentences improves as a result of presenting visualized chunks. The current study hypothesized that L2 learners' performance would improve under conditions in which their cognitive load is reduced. With additional attentional resources, they are able to pay more attention to inflectional morphemes that create cohesiveness in complex sentences. It was expected that visualized chunks would make the boundaries between clauses salient, thus enhancing the salience of inflectional morphemes that are by default located at the end of a clause. The theory behind this assumption stems from the Noticing Hypothesis (Schmidt, 1990, 2001). Under the Noticing Hypothesis, it is necessary for learners to pay close attention to particular elements of a target language to acquire them. Thus, a device that enhances the salience of a target item in the input is considered to be facilitative in bringing learners' attention to such an item. Based on the argument that L2 learners' performance suffers under the situation where explicit instruction is unavailable (R. Ellis, 2004), the current study examined the effect of cognitive support under an implicit condition.

This chapter presents summaries of the research results following the order of the research questions. The first question, deals with the effect of pictorial support. The second research question concerns syntactic elements that create difficulties for L2 learners' processing of complex sentences. This discussion mainly deals with the influence of salience, frequency, and learners' interlanguage level on the processing of inflectional morphemes. The third question deals with L2 learners' proficiency and their performance on EI. The final part of this chapter addresses study limitations and

pedagogical implications, before concluding with future directions to better understand the issue of L2 sentence processing.

The Effect of Visualized Chunks

The objective of the first the research question was to investigate whether L2 learners' ability to process complex sentences improves with the help of visualized chunks. The current study used pictures that corresponded to each clause in a complex sentence so that learners might be able to identify boundaries between clauses from aural input. Statistical analysis revealed the overall picture effect for all syntactic elements. It is particularly worth noting that visualized chunks enable learners to retrieve not only lexical information but also syntactic information that the pictures did not display.

Miller (1956) was among the first scholars to discover the effect of chunking on memory: People were better able to remember information when it was grouped into chunks. The current study confirmed that the effect of chunking applies to the repetition of complex sentences from aural input. As N. Ellis (2001) and Newell (1990) claimed, chunking enabled learners to integrate discrete information in memory; thus, they were able to deal with long and complex sentences.

The current study observed instances of another useful function of visualized chunks: They helped learners recall the events described in a sentence in the correct order. An episode during the pilot testing phase indicated the contribution of visualized chunks to remembering events in order. One of the L1 Japanese adults mentioned that she was trying to imagine pictures while listening to sentences, so that she did not forget the sequence of the events she heard. The strategy she adopted was exactly the function of visualized chunks that facilitated L2 learners' processing in the current study. In fact, when visualized chunks were unavailable to learners, they sometimes switched the order of events in a complex sentence. This lexical-item swapping occurred in the utterances

of 28 out of 35 learners at least once or twice during the experiment. For example, learners repeated “watch TV and listen to music” after they heard “listen to music and watch TV.” The lexical-item swapping never occurred in the with-picture condition, but it occurred randomly regarding any clauses across sentence types in the without-picture condition. These instances suggest that visualized chunks not only help learners consolidate information but also enable them to keep events in order.

The above-mentioned findings confirm the effect of dual modality support (Frick, 1984; Martin, 1980; Mousavi et al., 1995). In essence, with additional attentional resources, learners’ memory loss is minimized. As a result, they are able to (a) invest their attention in parts of the input that may otherwise disappear from memory, and (b) remember events in order. Parts of language that are susceptible to memory loss are typically located in sentence-internal position (Lewandowsky & Murdock, 1989; Spitze & Fischer, 1981). The functions that described learners’ production and accuracy (Figures 4.1, 4.3, 4.5, 4.7 and 4.9 in chapter IV) indicate that learners’ reconstruction of elements in the sentence internal position did not decline much when they were given pictorial support. This suggests that dual modality support was effective in mitigating learners’ memory loss.

The positive end result of dual modality support may be how it allows L2 learners to use their explicit knowledge. From observations made during the experiment, there were some instances in which learners noticed their own mistakes while looking at pictures on the computer screen and rephrased them successfully most of the time. This is an example of learners’ positive use of explicit knowledge. Pictures allowed learners to consult their own knowledge and reproduce a verb accurately according to the events depicted in a picture. In contrast, without pictorial information, learners had a hard time retaining information. In fact, accurate rephrasing never occurred without pictorial information. The instances of rephrasing suggest that learners are capable of retrieving

explicit knowledge from memory on their own when their attentional resources are not exhausted.

From the view of production, the benefit of dual modality support can be addressed in terms of lexical access. Levelt (1989) argues that grammatical encoding is lexically driven (p. 235). Under his hypothesis, the meaning of a sentence triggers processing of elements in sentences; specifically, a particular syntactic form. In the current study, learners did not produce sentences according to their intention. However, as Levelt claimed, it was highly likely that pictures assisted L2 learners in grasping the meaning of sentences, allowing them to select a matching syntactic form before aural input disappeared from memory. In this view, an aid to enhance learners' processing does not have to be a dual modality support, as long as an aid communicates a meaning to learners. For instance, Chinese characters are probably more effective than pictorial information to assist L1 Chinese speakers' understanding of the meaning of a sentence.

There is an alternative view to interpret the effectiveness of pictorial information. Morosin (2007) claims that mirror neurons play an important role for learning. Mirror neurons are groups of brain cells found in a region of the human frontal lobe close to the motor cortex, and these cells respond to others' actions. According to Morosin, mirror neurons enable human beings to understand the meaning of others' actions through observation. She postulates that a visual context is facilitative for language learning because it offers a learning environment that utilizes mirror neurons. Such views need to be empirically examined to better understand how a visual context contributes to the comprehension of meanings.

What Pictorial Information Cannot Help

The results of the current study suggest that visualized chunks reduced L2 learners' cognitive load and, as a result, learners were able to pay closer attention to syntactic elements from aural input. However, cognitive load reduction did not

necessarily enable learners to produce accurate sentences. As mentioned in the previous section, learners' reconstruction of the *tara*-form in sentence type *a*, in which *-tara* was located in sentence-internal position, did not improve with the help of pictorial information. The accuracy of the *tara*-form in sentence type *e* did not improve either. In this case, the *tara*-form was located in a sentence-initial position; thus, the form might be salient enough without pictorial support. This lack of improvement indicates that the effect of pictorial information diminishes after learners' accuracy reaches or drops to a certain level (i.e., ceiling and floor effects). In sentence type *a*, the accuracy of reconstructing the *tara*-form was 11.4 % in the without-picture condition and 9.4% in the with-picture condition. No statistically significant difference was found between these conditions. The low accuracy rate may suggest that learners suffered from the floor effect where their performance could not improve even with the help of pictorial information. Similarly, lack of improvement in learners' reconstruction of the *tara*-form in sentence type *e* indicates the ceiling effect. The accuracy rate of producing the *tara*-form was already 44.8% without pictorial support, indicating that learners' performance might have reached the highest possible level. In the with-picture support condition, the accuracy rate was 46.2%, which was almost the same level as the without-picture condition. Similar results were found in previous studies that attempted to increase learners' listening comprehension by inserting pauses in aural input. In Blau (1990), high proficiency learners did not benefit from pauses as much as low proficiency learners did. In Harley (2000), pauses did not enhance learners' listening comprehension when the aural text dealt with a familiar topic. In sum, a device that intends to increase salience in the input may be effective only if the content is not too difficult or too easy for learners.

As already reported, the largest effect of visualized chunks was observed in the reconstruction of noun and verb lexical choices. However, there were a small number of lexical items with which learners replaced a wrong verb despite the pictorial

information they saw. Such lexical items were *shawaa o abiru* ‘to take a shower’ and *te o arau* ‘to wash hands’. *Abiru* was replaced by *asobu* ‘to have fun; to hang out’ and *arau* was replaced by *owaru* ‘to end; to finish’. Eleven out of 35 learners made this type of erroneous verb replacement in the with-picture condition once during the experiment, except for one learner who replaced a correct verb with a wrong verb twice. Ten learners made this type of erroneous replacement in the without-picture condition (seven learners once, two learners twice, and one learner three times, respectively). Cognitive load reduction may increase learners’ attentional capacity, but it does not alter their perception. Levelt (1989) argues that phonologically similar items are connected in the mental lexicon (p. 184). It is possible that phonologically similar sounds in the above verbs caused the L2 learners’ failure to correctly distinguish these verbs even with pictorial information.

Even though the effect of visualized chunks is restricted, its overall effect was found to be exceptionally large (p <.001, $\eta^2 p$ = .603). Considering the fact that the participants in the current study were enrolled in second-year Japanese, their linguistic competence was still at the level at which additional support effectively increased attentional resources. The effect of pictorial support might not be as significant as in the current study if learners’ proficiency were at an advanced level. Further research is necessary to find the extent to which pictorial information is facilitative for L2 learners of differing proficiency levels.

Reconstruction of Syntactic Elements

Salience

One of the major findings of the current study was the influence of salience on the processing of complex sentences. The results showed that learners’ ability to process syntactic elements was affected by their salience: Verbs were more difficult to process than nouns or particles. In Japanese, verb morphemes constantly change their shape and,

as a result, low proficiency L2 learners are unable to recognize the original verbs after they are inflected; thus, verb morphemes are considered low in salience. Within verbs, inflectional morphemes were more difficult than conjugations, and conjugations were more difficult than the lexical choice of a verb.

The current study confirmed the claim made by Bley-Vroman and Chaudron (1994) that location creates difference in salience; exactly the same verb may be processed differently depending on its location in a sentence. The L2 learners in the current study perceived the same inflectional morpheme differently depending on its syntactic location. Salience was one of the factors that influenced noticing under the Noticing Hypothesis (Schmidt 1990), according to which items low in salience are less likely to grab learners' attention, thus making acquisition of such items difficult. The current study found that the negative effect of salience persists even with an item familiar to learners. The *te*-form, with which learners in the current study were very familiar, was processed with significantly less accuracy than the sentence-final predicate when *-te* was located in a sentence-internal position in sentence type *c*.

Besides location, redundancy also affects the salience of an item (Jiang, 2007). Some syntactic items are redundant in meaning when another syntactic element expresses the same concept (N. Ellis & Collins, 2009) or does not affect the meaning of a sentence (Gor, 2010). For example, L2 learners of English experience difficulty processing and producing the past tense marker *-ed* because many times an adverbial expression provides temporal information, which allows learners to understand the tense without processing the inflectional morpheme (N. Ellis, 2006; 2008). Similarly, redundancy may explain the difficulty of processing *-tari shimasu* 'do things such as'. *Shimasu* is redundant in meaning, because this *shimasu* only coordinates activities described in the preceding clauses. Activities described in a sentence are comprehensible just by hearing the verbs marked with *-tari*; therefore, lack of *-tari shimasu* in learners' production would not cause any breakdown in communication.

The findings of the current study also suggest that redundancy in meaning overrides locational salience. By default, *-tari shimasu* occurs in sentence-final position; and it is therefore expected to be salient in terms of location. Nevertheless, when learners were asked to repeat a sentence, they reduced (verb)-*tari shimasu* to (verb)-*masu* many times. This reduction probably occurred due to low salience of *-tari shimasu* in meaning. According to VanPatten (2002, 2004), L2 learners pay attention to meaning first. When learners' attentional resources are consumed by a search for meaning, they fail to invest attention in syntactic information. He further argues that the absence of forms in learners' speech indicates that a learner has not processed them in the input. The current study lends support to VanPatten's argument that learners tend not to process items that have low communicative value.

Other Factors that May Influence L2 Processing

Besides perceptual salience, the Noticing Hypothesis proposed some factors that may facilitate L2 learners' awareness. Such factors include L2 learners' current interlanguage level and frequency of input. The L2 learners' ability to reconstruct three target structures may be a reflection of their interlanguage level at the time of the experiment. They might be proficient enough to recognize the *te*-form from input, but their proficiency may not have developed enough to process the other two inflectional morphemes. It is likely that the order of successful reconstruction among three types of inflectional morphemes was attributable to the frequency of input during classroom instruction.

However, unlike L1 acquisition in which input frequency is a crucial factor (Bybee, 2008; Doughty, 2003), L2 acquisition can take place in a situation where input is not abundant. L2 adult learners possess sophisticated cognitive abilities that L1 children have not developed, which enable them to utilize various strategies to acquire a language (Kempe & MacWhinney, 1998). Kempe et al. (2010) found that L2 learners

were capable of generalizing grammatical categories among unfamiliar nouns based on their analyses during training sessions. The results of their study and Ellis and Schmidt (1997) both indicate that L2 learners acquire morphemes showing regularity regardless of input frequency. In the current study, nouns were the easiest to reconstruct for L2 learners of Japanese, whereas nouns are not necessarily easy to process for L2 learners of other languages. Kempe et al. showed that L2 learners of Russian had difficulties categorizing nouns according to gender. Regularities among grammatical categories are also factors that influence L2 processing.

The Effect of Clause Type on the Processing of Particles

In addition to salience and frequency, the current study also examined the effect of clause type on the processing of particles. The *tara*-form was used in a subordinate clause, and subordination might impose an additional cognitive burden on learners' sentence processing. If so, elements inside a subordinate clause might be processed poorly as a result. The current study did not discover any proof that subordination affects the processing of particles.

There are multiple factors that account for the lack of influence of subordination. First, the current study intentionally chose most lexical items from the ones introduced in the first-year Japanese curriculum. Most particles used in the stimulus sentences were the direct object marker *o*, which was probably the most familiar particle for L2 learners. As shown in chapter III, the type-token ratio of particles was 22.5% on average, which was much lower than nouns (83.5%) or verbs (68.5%). Considering the small type-token ratio and participants' familiarity from previous semesters, processing of particles in stimuli was probably easy for the participants in the current study.

Additionally, it is highly likely that participants had not sufficiently developed their competence to be able to use both nouns and verbs as cues to find a correct particle. In order to make a correct particle choice, one must understand the relationship of a

verb and a noun in a clause. A relatively proficient learner would process a sentence while paying attention to a noun and a verb simultaneously (perhaps unconsciously). However, learners in the current study might have chosen a particle just by hearing a noun without considering its relationship to the verb. The influence of subordination might have been different if the stimuli included a variety of particles that had multiple functions and participants' proficiency level was more advanced. Further study is necessary to verify the influence of subordination on the processing of particles.

Proficiency and Processing of Syntactic Elements

In response to the third research question, the current study investigated whether learners' ability to imitate complex sentences from aural input is related to their receptive linguistic proficiency. Multiple regression analysis revealed that conjugation was the best predictor of proficiency. Analysis of learners' performance on EI revealed that the reproduction of inflectional morphemes was significantly more difficult than that of conjugation. However, in terms of the prediction of receptive proficiency, conjugation served as better predictor.

The high predictive ability of conjugation may be accounted for by its low salience. The meta-analyses conducted by Goldschneider and DeKeyser (2001) found that perceptual salience was the best predictor of the acquisition order of English grammatical morphemes. The results of the current study also indicate that salience plays an important role in SLA. In the case of Japanese, the conjugated part of a verb is surrounded by an initial part of a verb and an inflectional morpheme, and it constantly changes its shape according to verb type. In contrast, the shape of inflectional morphemes remains the same regardless of verb type. Therefore, the salience of a conjugation marker may be lower than that of an inflectional morpheme. Perhaps proficient L2 learners may be the ones who are able to find regularities in low-salience items. In order to make such a claim, it is necessary to conduct further studies involving

large numbers of learners with a wide range of proficiency levels. Additionally, the stimuli in future studies should include a wider variety of inflectional morphemes that require different conjugation rules in order to investigate the reliability of low-salience syntactic elements for the prediction of proficiency.

Study Limitations

L2 learners in the current study engaged in the repetition task for approximately 20 minutes and made significant improvement in reconstructing complex sentences during the task period. However, the study did not examine the long-term effect of extensive exposure to input, or whether learners are able to produce similarly complex sentences without aural input. To make implicit learning successful, learners need to hear as much input as possible. Frequency is an essential part of implicit learning (Bybee 2005; N. Ellis, 2005; Lieven & Tomasello, 2008). Thus, it is reasonable to think that a certain amount of input is necessary to see the effect of implicit practice. If learners are required to create sentences on their own, approximately 20 minutes of exposure to target structures may not be enough to store input in memory. Ellis and Schmidt (1997) investigated the acquisition of morphemes by repetition and showed that learners' performance constantly improved as they received input. However, they did not examine long-term effects, either. Future studies need to investigate the long-term effect of intensive practice through repetition.

The influence of learners' L1 has been one of the most frequently explored topics in the literature about L2 morpheme acquisition, yet this issue remains controversial. Some studies argue that learners' L1 influences L2 morphology acquisition (Gor, 2010; Gor & Cook, 2010). On the other hand, Parodi, Schwartz, and Clahsen (2004) argue that the influence of L1 is marginal, based on speech production data from longitudinal studies. They found that L2 learners of German exhibited difficulties in the acquisition of nominal bound morphology regardless of their L1

(Korean, Turkish, Italian, and Spanish). The current study did not use L2 learners' L1 background as a variable for the prediction of their receptive proficiency. Therefore, the current study is unable to provide answers about the influence of L1.

However, it is important to remember that the majority of participants in the current study are L1 English speakers. Elicited Imitation requires processing from aural input; and the results showed that learners' performance on the listening comprehension section was the most significant predictor of their EI performance. However, L1 Chinese speakers may be able to perform well on the Japanese proficiency test even if they perform poorly on the listening section, considering their advantage in reading Chinese characters. One of the two L1 Chinese speakers in the current study exhibited such a possibility. His score on EI ranked at the 21st percentile[16], while his score on the proficiency test ranked at 86th percentile. No other participants exhibited such a large gap between their scores on EI and the proficiency test, including the other L1 Chinese speaker. It is appropriate to conclude that EI's predictability of Japanese proficiency is strong for L1 speakers of English, but it may lose predictability when measuring L1 Chinese speakers' performance. In sum, a larger number of participants are necessary to make more reliable predictions about their Japanese proficiency, and their L1 should be taken into consideration.

Pedagogical Implications

The current study proposes the best condition to improve L2 learners' processing is to provide rules explicitly and practice implicitly. To promote learners' independence from explicit instruction, they should be encouraged to figure out the meaning and structures by themselves rather than being informed by a teacher. A

[16] Percentiles are values that divide the distribution into hundredths. For example, the 80th percentile indicates a point on the distribution below which 80% of the scores lie (Howell, 2007, p. 56).

pedagogical task such as a dictgloss[17] may be an ideal activity to encourage conscious listening and production of target structures. Dictogloss tasks encourage learners to listen to input consciously, while at the same time allowing them to use explicit knowledge.

The study found that participants in the current study benefitted from pictorial information regardless of their proficiency level. Dual modality may be especially facilitative during the early acquisition stage of L2, considering L2 learners' heavy reliance on acoustic and semantic cues to process aural input (Johnston & Doughty, 2007; Sanders et al., 2002). In the current study, pictorial information was proven to be effective in assisting learners' segmentation of complex sentences. The benefit of dual modality is applicable to more advanced learners who need additional help to process longer, more complex sentences.

From the observation of L2 learners' performance, it was evident that processing syntactic information without understanding the meaning of an item was nearly impossible. Typically, learners' repetition stopped when they encountered an unfamiliar lexical item. The current study recommends that language teachers use familiar lexical items if possible when introducing a novel structure to L2 learners. Similarly, it is ideal to introduce novel lexical items in a structure with which learners are familiar. In practice, it may be unavoidable to introduce new lexical items and a new grammatical concept simultaneously. Yet, it is important to remember that teaching a novel structure with new lexical items may place a heavy cognitive load on L2 learners and, as a result, as VanPatten (2002) claims, their memory capacity may be used up in the search for meaning. Therefore, special care must be taken to let learners understand the meaning

[17] Dictogloss is a dictation activity where learners are required to reconstruct a short text by listening and noting down key words (http://www.teachingenglish.org.uk/think/knowledge-wiki/dictogloss).

of new concepts. Textbook developers should avoid using novel vocabulary while introducing a new structure whenever possible.

Future Directions

One may wonder whether repetition is indeed facilitative for L2 processing. Krashen (1981) argued that production is not facilitative for language learning, as input gives primary importance to it. VanPatten (2002, 2004) also rejected the necessity of production, claiming the establishment of correct L2 input processing strategies leads to acquisition irrespective of production.

The current study argues that repetition is more facilitative than solely receiving a large amount of input, though repetition of input is not spontaneous production by any means. In the realm of SLA, the importance of production has been argued for decades. Swain (1985, 1995) proposed the Output Hypothesis based on her observation of L1 English children learning French in an immersion program. She claims that abundant input alone does not contribute to the acquisition of a second language, considering that their accuracy of production remains non-nativelike despite such copious input. According to her claim, output allows L2 learners to notice the gap between the target language and their interlanguage, thus contributing to their awareness. In this regard, repetition has at least one advantage over free production: In repetition, learners must focus on the surface structure of input. This makes it easy for learners to compare the structures of a target language with their interlanguage.

The speech production model proposed by Levelt (2003) also explains why production leads to greater awareness. Under this model, a speaker monitors own his/her speech while producing an utterance. In the process of speech production, a speaker may recognize an error in his/her own production. Rephrasing occurs when a speaker recognizes a gap between his/her intention and a surface structure. Without production, monitoring does not occur. Production is exactly what L2 learners lacked in

the immersion programs that Swain (1985) and Trahey and White (1993) studied. L2 learners in these studies were not encouraged to produce, and that may explain the reason they failed to recognize unique features in L2.

Despite theoretical support and some evidence from previous studies, the effect of output still remains controversial. Iwashita (1999), Swain (1998), and Swain and Lapkin (1995) indicate that production of a target language leads to L2 learners' correct usage. In contrast, Mitchell and Myles (2004) express reservation about the claim that output leads to learners' accurate production, drawing on the results of Izumi and Bigelow (2000), which indicated that learners who did not engage in output activity were also able to produce target-like forms. Future study is necessary to compare the effects of different learning conditions, namely input only and repetition, to verify the effect of production on accuracy. In addition, whether repetition leads to the improvement of free speech production needs to be examined.

Conclusion

The majority of the L2 literature suggests the advantage of explicit instruction over implicit instruction (DeKeyser, 2003; Norris & Ortega, 2000). The task L2 Japanese learners in the current study engaged in was implicit in nature because they were not given any instruction or feedback about their performance. Despite this lack of instruction, their performance on the last 10 stimuli significantly improved over the first 10. Returning to the issue of knowledge interface, the current study supports a weak interface position that assumes explicit knowledge can be transformed into implicit knowledge under certain conditions (Bialystok, 1982; N. Ellis, 2005; R. Ellis, 2005). L2 Japanese learners' improvement during the task can be explained by the fact that they have already learned the target structures in class. With explicit knowledge, learners might become capable of extracting what they have learned from memory and begin reconstructing complex sentences automatically after being exposed to them.

As the Noticing Hypothesis claims, L2 learners need to invest their attention in forms to acquire them. It should be underscored that the goal of repetition should not be the imitation of native-like accuracy and fluency. One needs to remember the fact that the audio lingual method has been severely criticized for lack of communicative value. Repetition should be considered a useful tool to reinforce what learners have learned. Once learners' processing is automated, probably their cognitive load does not suffer too much when they engage in real communication.

In practice, at least two conditions must be met to ensure the effectiveness of sentence repetition: (a) a sentence to be repeated should be introduced in a clear context, and (b) repetition should begin approximately three seconds after a learner hears a sentence (Cowan, 1993). These two conditions are important to encourage L2 learners to repeat sentences based on their understanding of the meaning. What L2 learners should aim for is "mindful repetition," which N. Ellis (2002) suggests. If learners engage in repetition while thinking about a context in which a sentence or a phrase is actually used, repetition may be integrated into the knowledge they have stored in memory.

APPENDIX A. JAPANESE VERB CONJUGATION RULES

The *-te, -tari, -tara* forms are made from the plain form based on the following rules.

- Irregular verbs (only ‘to do’ and ‘to come’)

Memorize the following formation

The plain form	*Meaning*	*The te-form*	*The tari-form*	*The tara-form*
suru	to do	*shite*	*shitari*	*shitara*
kuru	to come	*kite*	*kitari*	*kitara*

- The *ru*-verbs (Verbs that end with either *-eru* or *–iru*)

Replace the last *-eru* or *–iru* with *–te, -tari* or *-tara*

The plain form	*Meaning*	*The te-form*	*The tari-form*	*The tara-form*
miru	to watch	*mite*	*mitari*	*mitara*
taberu	to eat	*tabete*	*tabetari*	*tabetara*

- The *u*-verbs

Verb that end with either *–u, –tsu* or *–ru*: Replace the last mora with *-tte, -tari* or *-tara*

The plain form	*Meaning*	*The te-form*	*The tari-form*	*The tara-form*
matsu	to wait	*matte*	*mattari*	*mattara*

Verbs that end with either *–mu, –bu* or *–nu*: Replace the last mora with *-nde, -ndari* or *-ndara*

The plain form	*Meaning*	*The te-form*	*The tari-form*	*The tara-form*
nomu	to drink	*nonde*	*nondari*	*nondara*

Verb that end with -s*u*: Replace the last mora with *-shite, -shitari* or *-shitara*

The plain form	*Meaning*	*The te-form*	*The tari-form*	*The tara-form*
hanasu	to talk	*hanashite*	*hanashitari*	*hanashitara*

Verb that end with *-ku*: Replace the last mora with *-ite -itari* or *-itara*

The plain form	*Meaning*	*The te-form*	*The tari-form*	*The tara-form*
kaku	to write	*kaite*	*kaitari*	*kaitara*

**Iku* (to go) is an exception that ends with *–ku* but its *te*-form is *itte*

Verbs that end with *-gu*: Replace the last mora with *–ide, -idari* or *-idara*

The plain form	*Meaning*	*The te-form*	*The tari-form*	*The tara-form*
oyogu	to swim	*oyoide*	*oyoidari*	*oyoidara*

APPENDIX B. STIMULI

The numbers in parenthesis indicate morae.

a. …*te,* ….*te,* …*tara,*sentence-final predicate

Baa ni itte ongaku o kiite osake o nondara uta o utaimasu. (30)

= (I'm) going to a bar, then (we'll) listen to music and after (we) drink (we'll) sing.

Tenisu o shite inu to asonde sooji o shitara tabako o suimasu. (28)

= (I'll) play tennis, then (I'll) play with (my) dog and after (I) clean up (I'll) smoke a cigarette.

Hon o yonde repooto o kaite uchi ni kaettara ongaku o kikimasu. (31)

= (I'll) read a book, write a paper, and after (I) go home, (I'll) listen to music.

Tabemono o katte ryori o shite gohan o tabetara ocha o nomimasu. (29)

= (I'll) buy some foods, cook dinner and after (I) eat (I'll) drink tea.

Gakko ni itte tomodachi ni atte hanashi o shitara uchi ni kaerimasu. (31)

= (I'll) go to school, meet friends and after (I) talk with them (I'll) go home.

Asa okite shawaa o abite koohii o nondara gohan o tabemasu. (29)

= (I) get up in the morning, take a shower and after (I) drink some coffee (I) eat breakfast.

Uchi ni kaette shukudai o shite te o arattara gohan o tsukurimasu. (30)

= (I) go home, do my homework, and after (I) wash my hands (I) cook a meal.

Repooto o kaite benkyoo shite hon o yondara tomodachi ni aimasu. (30)

= (I'll) write a paper, study, and after (I) read a book (I'll) meet my friends.

Inu to asonde gohan o tabete repooto o kaitara nemasu. (26)

= (I'll) play with my dog, eat dinner and after I write a paper, (I'll) go to bed.

Heya ni haitte mado o shimete denki o keshitara eega o mimasu. (28)

= (I'll) enter (my) room, close the windows and after (I) turn off lights (I'll) watch a move.

Koohii o nonde shinbun o yonde shawaa o abitara dekakemasu. (29)

= (I'll) drink some coffee, read a newspaper and after (I) take a shower (I'll) leave.

Shiken ga owatte uchi ni kaette kazoku ni attara ryokoo o shimasu. (30)

= When exams are over, (I'll) go home, and after (I) see my family (I'll) take a trip.

b. …*tara, ...te, ...te*, sentence-final predicate

Eegakan ni ittara juusu o katte isu ni suwatte eega o mimasu. (32)

= When (I) go to a movie theater, (I'll) buy juice, take a seat, and watch a movie.

Te o arattara gohan o tabetara ocha o nonde ongaku o kikimasu. (29)

= After (I) wash (my) hands, (I) eat dinner, drink some tea and watch TV.

Asa okitara mado o akete shawaa o abite shinbun o yomimasu. (28)

= After (I) wake up, (I) open the windows, take a shower and read a newspaper.

Uchi ni kaettara tabako o sutte repooto o kaite nemasu. (26)

= After (I) go home, (I) smoke a cigarette, write a paper and go to bed.

Inu to asondara te o aratte ryori o shite gohan o tabemasu. (28)

= After (I) play with (my) dog, (I'll) wash my hands, cook a meal and eat.

Ofuro ni haittara ongaku o kiite terebi o mite shukudai o shimasu. (31)

= After (I) take a bath, (I) listen to music, watch TV and do my homework.

Shiken ga owattara uchi ni kaette kazoku ni atte dekakemasu. (28)

= After exams are over, (I'll) go home, see my family and go out.

Tenisu o shitara, mizu o nonde shawaa o abite uchi ni kaerimasu. (28)

= After (I) play tennis, (I'll) drink some water, take a shower, and go home.

Ame ga futtara basu ni notte omise ni itte kaimono o shimasu. (28)

= When it rains, (I) take a bus, go to shops and buy something.

Jugyoo ga owattara uchi ni kaette inu to asonde sooji o shimasu. (30)

= When the class is over, (I) go home, play with (my) dog and clean up. (30)

Baa ni ittara tomodachi to hanashite uta o utatte osake o nomimasu. (31)

= When (I) go to a bar, (I) talk with my friends, sing songs and drink.

Repooto o kaitara ongaku o kite tabako o sutte denwa o kakemasu. (32)

= After (I) write a paper, (I'll) listen to music, smoke a cigarette, and call someone up. (32)

c. *…te, …tara, ….te*, sentence-final predicate

Shiken ga owatte uchi ni kaettara terebi o mite dekakemasu. (27)

= After the exam is over and (I) go home, (I'll) watch TV and go out.

Ryo ni kaette shukudai o shitara denwa o kakete tomodachi to hanashimasu. (32)

=After (I) return to my dorm and do my homework, (I'll) call up and talk with my friends.

Baa ni itte tomodachi ni attara uta o utatte ongaku o kikimasu. (31)

= When (I) go to a bar and meet friends, (we'll) sing songs and listen to music.

Gohan o tsukutte sooji o shitara isu ni suwatte ocha o nomimasu. (29)

=After (I) cook and clean up, (I'll) sit down and drink tea.

Osake o nonde uta o utattara tomodachi to hanashite tabako o suimasu. (32)

=After (I) drink and sing songs, (I'll) talk with my friends and smoke.

Asa okite shinbun o yondara shawaa o abite gohan o tabemasu. (29)

=After (I) get up and read a newspaper, (I) take a shower and eat breakfast.

Koofee o nonde tabakoo o suttara denki o keshite, terebi o mimasu. (30)

=After (I) drink some coffee and smoke a cigarette, (I'll) turn off the lights and watch TV.

Densha ni notte isu ni suwattara ongaku o kiite hon o yomimasu. (30)

= When (I) get on a train and take a seat, (I) listen to music and read a book.

Tomodachi ni atte kaimono o shitara, eega o mite uchi ni kaerimasu. (30)

=After I meet my friends and go shopping, (we'll) watch a movie and go home.

Uchi ni kaette inu to asondara hon o yonde repooto o kakimasu. (30)

=After (I) go home and play with (my) dog, (I'll) read books and write a paper.

Gohan o tabete ofuro ni haittara ongaku o kiite nemasu. (27)

=After (I) eat dinner and take a bath, (I) listen to music and go to bed.

Kooen ni itte tenisu o shitara uchi ni kaette shawaa o abimasu. (30)

=After (I) go to the park and play tennis, (I) go home and take a shower.

d. …*te, …tari, ….tari,* sentence-final predicate

Tomodachi ni atte koohee o nondari hanashi o shitari shimasu. (27)

= (I'll) meet my friends and then do such things as drink some coffee, talk, etc.

Kooen ni itte tenisu o shitari shashin o tottari shimasu. (26)

= (I'll) go to the park and then do such things as play tennis and take photos, etc.

Uchi ni kaette inu to asondari kazoku to hanashitari shimasu.(27)

= (I) go home and then do such things as play with my dog and talk with my family, etc.

Ryoo ni kaette repooto o kaitari hon o yondari shimasu. (26)

= (I) go back to my dorm and then do such things as write a paper and read books, etc.

Tomodachi to dekakete gohan o tabetari eiga o mitarhi shimasu. (27)

= (I'll) go out with my friends and then do such things as eat together and watch a movie, etc.

Heya ni haitte denwa o kaketari konpuutaa o tsukattari shimasu. (30)

= (I) enter a room and then do such things as telephone, use a computer, etc.

Tomodachi ni atte eiga o mitari mise de kaimono shitari shimasu. (29)

= (I) meet friends and then do such things as watch a movie, buy things at shops, etc.

Densha ni notte tomodachi to hanashitari ongaku o kiitari shimasu. (29)

= (I) take a train and then do such things as talk with friends, listen to music, etc.

Toshokan ni itte shinbun o yondari shukudai o shitari shimasu. (28)

= (I'll) go to the library and then do such things as read a newspaper, do my homework, etc.

Nihon ni itte osushi o tabetari shashin o tottari shimasu. (26)

= (I'll) go to Japan and then do such things eat *sushi,* take photos, etc.

Konpuutaa o tukatte ongaku o kiitari eiga o mitari shimasu. (30)

= (I) use a computer and then do such things as listen to music, watch a movie, etc.

Osake o nonde tabako o suttari uta o utattari shimau. (26)

= (I) drink and then do such things as smoke and sing a song, etc.

e. *…tara, …tari, ….tari*, sentence-final predicate

Baa ni ittara uta o utattari osake o nondari shimasu. (26)

= When (I) go to a bar, (I) do things such things as sing songs and drink.

Densha ni nottara ongaku o kiitari shinbun o yondari shimasu.(28)

= When/after (I) get on the train, (I) do things such as listen to music, read a newspaper, etc.

Ryo ni kaettara, tomodachi to hanashitari shokudai o shitari shimasu. (29)

= When/after (I) go back to my dorm, (I'll) do things such as talk with my friends, do homework, etc.

Uchi ni kattara hon o yondari inu to asondarii shimasu. (26)

= When/after (I) go home, (I'll) do things such as read books, play with my dog, etc.

Natsu ni nattara puuru de oyouidari eiga o mitari shimasu. (26)

= When summer comes, (I'll) do things such as swim in a pool, watch movies, etc.

Ryooshin ga kitara keeki o tabettari ongaku o kiitari shimasu. (28)

= When my parents come over, (we'll) do things such as eat cake, listen to music, etc.

Nihon ni ittara shashin o tottari sakana o tabetari shimasu. (27)

= When (I) go to Japan, (I'll) do things such as take photos, eat fish, etc.

Shiken ga owattara tomodachi to dekaketari puuru de oyoidari shimasu. (31)

= When/after exams are over, (I'll) do things such as go out with friends, swim in a pool, etc.

Tomodachi to dekaketara eiga o mitari omise ni ittari shimasu. (28)

= When (I) go out with my friends, (we'll) do things such as watch movies, go to stores, etc.

Ame ga futtara konmpuutaa o tsukattari tomodachi to hanashitari shimasu. (32)

= When it rains, (I'll) do things such as use my computer, talk with my friends etc.

Tomodachi ni attara koohee o nondari kaimono o shitari shimasu. (29)

= When/after I meet friends, (we'll) do things such as drink some coffee, go shopping, etc.

Toshokan ni ittara shukudai o shitari compuutaa o tsukattari shimasu. (32)

= When/after (I) go to the library, (I'll) do things such as study, use a computer, etc.

APPENDIX C. DISTRACTERS

The numbers in parenthesis indicate morae.

a. *…kara,…to iimashita/kikimashita/omoimasu*

Osake o nomu kara baa ni iku to iimashita. (19)

= (I) said "(I'll) drink so (I'm) going to a bar."

Eega o miru kara eegakan ni iku to omoimasu. (22)

= (I'll) watch a movie so (I'm) think about going to a movie theater.

Konpyuutaa o tsukau kara toshokan ni iku to kikimashita. (25)

= (I) heard "(I'll) use a computer so (I'm) going to the library."

Terebi o miru kara denki o kesu to iimashita. (20)

= (I) said "(I'm) watching TV so (I'll) turn off the lights."

Neru kara denki o kesu to omoimasu.(17)

= (Someone is) going to bed so (I) think (someone will) turn off lights.

Repooto o kaku kara konpuutaa wo tukau to kikimashita. (25)

= (I) heard "(I'll) write a paper so (I'm) using a computer".

Nemui kara koohee o nomu to iimashita. (18)

= (I) said "(I'm) sleepy so (I'll) drink some coffee."

Tabako o suu kara mado o akeru to omoimasu. (20)

= (They) smoke so (I) think (they will) open the window.

Tabemono o kau kara suupaa ni iku to kikimashita. (22)

= (I) heard "(I'm) buying foods so (I'll) go to a supermarket."

Eega o miru kara conpuutar o tsukau to iimashita. (24)

= (I) said "(I'm) watching a movie so (I'll) use a computer."

Ryokoo o suru kara gaidobukku o yomu to omoimasu. (24)

= (I'm) traveling so (I) think (I'll) read a guidebook.

Tomodachi ni au kara denwa o kakeru to kikimashita. (22)

= (I) heard "(I'm) meeting my friends so (I'll) give them a call."

Dekakeru kara shawaa o abiru to iimashita. (19)

= (I) said "(I'm) going out so (I'll) take a shower."

Kazoku to hanasu kara denwa o kakeru to omoimasu. (21)

= (They will) talk with (their) family so (I) think (they'll) give a call to (their) family.

Nihon ni iku kara nihongo o benkyoosuru to kikimashita.

= (I) heard "(I'm) going to Japan so (I'm) studying Japanese."

Gakkoo ni iku kara densha ni noru to iimashita. (21)

= (I) said "(I'm) going to school so (I'll) take a train."

Shiken ga owatta kara kare to dekakeru to omoimasu. (23)

= Exams are over so (I'm) think about going out with my boyfriend.

Natsu ni natta kara puuru de oyogu to kikimashita. (21)

= (I) heard "Summer has come to (I'm) going to swim in a pool."

Netsu ga aru kara byooin ni iku to iimashita. (20)

= (I) said "I have a fever so (I'm) going to a clinic."

Atama ga itai kara uchi de neru to omoimasu. (20)

= I have a headache so (I) think (I'll) sleep at home.

Kazoku ni au kara uchi ni kaeru to kikimashita. (20)

= (I) heard "(I'll) see my family so (I'm) going home."

Inu to asobu kara kooen ni iku to iimashita. (21)

= (I) said "(I'm) playing with my dog so (I'm) going to a park."

Uta o utau kara karaoke baa ni iku to omoimasu. (23)

= (I'm) singing songs so (I) think (I'm) going to a karaoke bar.

Sushi o taberu kara resutoran ni iku to kikimashita. (22)

= (I) heard "(I'm) eating sushi so (I'm) going to a restaurant."

Okane ga nai kara arubaito o suru to iimashita. (22)

= (I) said “(I) have no many so (I’ll) work.”

Ryooshin ga kuru kara sooji o suru to omoimasu. (21)

= (My) parents are coming so (I) think (I’ll) clean up.

Gohan o tsukuru kara te o arau to kikimasita.(20)

= (I) heard “(I’m) cooking dinner so (I’ll) wash my hands.”

Shashin o toru kara kooen ni iku to iimashita. (21)

= (I) said “(I’m) taking pictures so (I’m) going to a park.”

Byooin ni iku kara basu ni noru to omoimasu. (20)

= (I’m) going to the clinic so (I) think (I’ll) take a bus.

Tabemono o kau kara omise ni iku to kikimashita. (21)

= (I) heard “(I’m) buying food so (I’m) going to a shop.”

Kuruma ni noru kara ongaku o kiku to iimashita. (21)

= (I) said “(I’m) riding in my car so (I’ll) listen to music.”

Atsui kara puuru de oyogu to omoimasu. (18)

= It’s hot so (I’m) think about swimming in a pool.

Samui kara seetaaa o kiru to kikimahsita. (18)

= (I) heard “It’s cold so (I’ll) wear a sweater.”

Netsu ga aru kara seetaa o kiru to iimashita .(20)

= (I) said “(I) have a fever so (I’ll) wear a sweater.”

Ame ga furu kara basu ni noru to omoimasu. (18)

= It’s raining so (I’m) thinking about taking a bus.”

Hima da kara tomodachi ni denwa o kakeru to kikimashita. (23)

= (I) heard “(I’m) free so (I’ll) call up my friends.”

Koohii no nomu kara kissaten ni iku to iimashita. (23)

= (I) said “(I’m) drinking some coffee so (I’m) going to a café.”

Okane ga nai kara ryooshin ni denwa o kakeru to omoimasu. (26)

= (I) have no money so (I’m) thinking about calling (my) parents.

Atsui kara mizu o nomu to kikimashita. (16)

= (I) heard "It's hot so (I'll) drink water."

Gohan o tsukuru kara tabemono o kau to iimashita. (22)

= (I) said "(I'm) cooking dinner so (I'm) buying some foods."

b. *…shi, …kara,* sentence-final predicate (10)

Okane ga nai shi nemui kara takusan nemasu.(19)

= (I) have no money and (I'm) sleepy, so (I'll) sleep a lot

Onaka ga itai shi netsu mo aru kara uchi ni imasu. (21)

= (My) stomach hurts and I have a fever too, so (I'll) stay home.

Netsu ga aru shi atama mo itai kara byooin ni ikimasu. (24)

= (I) have a fever and (I) also have a headache, so (I'll) go to a clinic.

Rainen nihon ni iku shi ima okanega arubaito o shimasu. (28)

= (I'm) going to Japan next year and (I) don't have money, so (I'll) work.

Tenki ga warui shi samui kara uchi de terebi o mimasu. (23)

= The weather is bad and it's cold, so (I'll) watch TV at home.

Netsu ga aru shi samui kara seetaa o kimasu. (19)

= (I) have a fever and it's cold, so (I'll) wear my sweater.

Ashita ryooshin ga kuru shi sooji o suru kara uchi ni kaerimasu. (27)

= (My) parents are coming tomorrow and (I'll) clean (my room) so (I'll) go home.

Shiken ga owatta shi hima da kara tomodachi to dekakemasu. (24)

= The exams are over and (I'm) free so (I'll) go out with my friends.

Heya ga kitanai shi ryooshin ga kuru kara sooji shimasu. (23)

= (My) room is messy and (my) parents are coming so (I'll) clean my room.

Samui shi gogo ame ga huru kara uchi de ongaku o kikimasu. (25)

= It's cold and it'll rain in the afternoon so (I'm) listening to music at home.

c.…*kedo, ...kara*, sentence-final predicate

Ii tenki da kedo, netsu ga aru kara kyoo wa dekakemasen. (24)

= The weather is nice but (I) have a fever so (I) won't go out today.

Samui kedo taboko o suu kara mado o akemasu. (20)

= It's cold but (I) smoke a cigarette so (I'll) open the window.

Nemui kedo shukudai ga aru kara koohee o nomimasu. (23)

= (I) got sleepy but (I) have homework so (I'll) drink coffee.

Onaka ga itai kedo ii tenki da kara tenisu o shimasu. (24)

= (My) stomach hurts but the weather is nice, so (I'll) play tennis.

Shukudai ga aru kedo nemui kara nemasu. (17)

= (I) have homework assignment but (I) got sleepy so (I'll) go to bed.

Tabako o suu kedo samui kara mado o shimemasu. (25)

= (I) smoke but it is cold so (I'll) close the window.

Isogashii kedo ryooshin ga kuru kara sooji o shimasu. (23)

= (I'm) busy but my parents are coming so (I'll) clean up.

Atama ga itai kedo shukudai ga aru kara benkyoo shimasu. (25)

= (I) have a headache but (I) have homework assignment so (I'll) study.

Taitee gohan o tsukuru kedo kyoowa isogashii kara tesutoran ni ikimasu. (33)

= (I) usually cook meals but (I'm) busy today so (I'll) go to a restaurant.

Okane ga nai kedo hima da kara ongaku o kikimasu. (22)

= (I) have no money but (I'm) free so (I'll) listen to music.

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