The Impact of Argument-Omitted Sentences in Learning Japanese Direct Object Case-Markers

Akiko Zhao, Yingyi Luo, and Hiromu Sakai

1. Introduction

Languages indicate subject and object in transitive sentences in different ways (e.g., Bates & MacWhinney, 1989). For instance, in English, word order is the most reliable cue to identify the subject and object in a sentence.

(1) The mother slaps the father.
(2) The father slaps the mother.

In example (1), “mother” is the subject, and “father” is the object. While, in example (2), “father” is the subject, and “mother” is the object. These examples use word order because the first noun is usually the subject and the second noun is usually the object in transitive sentences. However, in Japanese, word order is not a reliable cue to identify subjects and objects all the time.

(3) mama ga papa wo tataku.
mother-NOM father-ACC slaps
“The mother slaps the father.”
(4) mama wo papa ga tataku.
mother-ACC father-NOM slaps
“The father slaps the mother.”

In example (3), “mother” is the subject, and “father” is the object. On the other hand, in example (4), “father” is the subject, and “mother” is the object. These sentences contain Japanese case-markers: ga is a subject case-marker and wo is an object case-marker.

Japanese-speaking children start to use both subject and object case-markers between 1;8 - 2;6 years-of-age spontaneous speech (Please the examples below from Clancy, 1985).

(5) mama-ga mizu iretanone (2;1)
mom-NOM water put in
“mom put in water”
(6) okane-wo mottetta (2;0)
   money-ACC took
   “(someone) took money”
(7) keeki wo katte (2;7)
   cake-ACC buy
   “(Please) Buy a cake”

However, children under five-years-old have not acquired case-marker knowledge. Children use ga incorrectly as in examples (8) and (9). In these examples, children used ga instead of wo, because they are using ga as a chunk (e.g., a set with a noun) such as “noun + ga” (Clancy, 1985). Moreover, children misunderstand scrambling sentences, as in example (10). In this sentence, they misidentify “onisan” as the subject and “onesan” as the object because they are using word order information (e.g., Hayashibe, 1975). This indicates that the first noun is the subject and the second noun is the object.

(8) mizu-ga*(wo) iretanoni (2;1)
   water-*NOM put is
   “put is water”
(9) konnano-*ga(wo) mite (2;8)
   this one-*NOM look at
   “Please look at this one”
(10) onisann wo onesan ga oshita
    boy-ACC girl-NOM pushed
    “The girl pushed the boy”

This study examined the effectiveness of full-argument sentences, sentences with two arguments and word order information, for children to comprehend object case-markers. The next section will give a critical review of the previous studies which investigated argument information and Japanese case-markers learning.

2. The Effects of the Full-Argument Sentence and Argument-Omitted Sentence for Language Learning

Decades of research have documented argument information such as their frequency, position and word order information as useful cues for children to learn new words (e.g., Waxman, Lidz, Braun & Lavin, 2009; Arunashalam & Waxman, 2010; Mintz & Gleitman, 2004 Fisher, Klingler & Song, 2006), and to distinguish subject-object relation of nouns in the sentence (e.g., Gertner, Fisher & Eisengart, 2006; Gertner & Fisher, 2012; Hayashibe, 1975).

Experimental studies have demonstrated that English-speaking two-year-olds utilize argument information to distinguish whether a word is a noun or a
verb when learning new vocabulary (Arunachalam & Waxman, 2010). In Arunachalam and Waxman’s (2010) experiment, children listened to two different types of sentences which used a new word. Afterwards, they were shown two different scenes. Participants were asked to connect the sentences to the appropriate scenes. The result showed that the participants successfully mapped the new word to the correct scene. This result suggested that two year olds were able to utilize argument information to distinguish whether a word is a noun or a verb. This was found in other similar studies (e.g., Imai, Haryu, Okada, Lianjing & Shigematsu, 2006).

In another similar study, Gertner et al. (2006) examined how 2-year-old English-speaking participants identify subjects and objects (subject-object relation) in sentences (i.e., Subject-Verb-Object (S-V-O): The duck is gorping the bunny.”) In the experiment, the experimenter showed two scenarios and gave S-V-O sentences to the participants. In one of the pictures, the agent is doing something to the patients. In the other picture, the agent and the patient were reversed. The participants were required to choose the sentence that semantically matched the pictures. Results showed that participants comprehend sentences by utilizing word order information. This was found in other similar studies (e.g., Hayashibe, 1975).

However, in several languages, such as Chinese, Korean and Japanese, both adults and children tend to drop arguments in their utterances. For instance, case-markers with subject and object arguments are often omitted in Japanese sentences, as seen in Examples 12 and 13 (Shibatani, 1990; Matsuo, Kita, Shinya, Wood & Naigles, 2012; Omaki, Kobayashi, Lassotta, Rizzi & Franck, 2012).

(12) mama-ga tataita
    mother-NOM slaps
    “The mother slaps (someone)”

(13) papa-wo tataita
    father-ACC slaps
    “(Someone) slaps the father”

Example 12 shows an object argument omitted sentence while Example 13 shows a subject omitted sentence. According to Matsuo et al. (2012) who studied parent’s utterances in Japanese, transitive verbs appeared with both overt subjects and objects just over 1.3% (e.g., “mama-ga papa-wo tataita: mother-NOM father-ACC slaps”), and objects appeared with “wo” over 5% of the time (e.g., “papa-wo stataita: father-ACC slaps”). Arunachalam et al., (2013) investigated the effects of argument omission in language learning. Specifically, they focused on how Korean children learn verbs. In Korean, it is difficult for children to utilize argument information to learn verbs since they have very few opportunities to hear sentences with complete argument information (i.e., full-
argument sentence). Specifically, children learning Korean have difficulty learning the meanings of novel transitive verbs if they appeared in full-argument sentences, with two arguments (e.g., subject and object), than in argument-omitted sentence, with both arguments elided (Arunachalam et al., 2013).

As mentioned above, Japanese is also a language that children have very few opportunities to hear sentences with argument information because of omission. If Japanese-speaking children also find it difficult to utilize full-argument sentences like Korean-speaking children, word-order information will not be an effective tool to learn object case-markers.

In experiment 1, therefore, we tested the effect of full-argument sentences and argument-omitted sentences. Specifically, we investigated if full-argument sentences or argument-omitted sentences were effective for Japanese-speaking children to learn object case-markers. We taught artificial subject and object case-markers to participants using full-argument sentences (full-argument condition) and argument-omitted sentences (argument-omitted condition). Then, participants completed forced-choice discrimination of scenarios after hearing OSV sentences with either po or bi. Our prediction was that, if children utilized word order to learn case-markers, children who learned case-markers in full-argument sentences would comprehend case-markers better than children who learned case-markers in argument-omitted sentences.

On the other hand, in daily input, children are exposed to not only one type of sentence but at least two types of sentences (i.e., not only full-argument sentences, but also argument-omitted sentences). Based on the data from JUN corpus from the CHILDES database (Ishii, 1999; MacWhinney, 2000), children are exposed to 1.3% full-argument sentences and 5% subject-omitted sentences in daily input (Matsuo et al., 2012). In experiment one, the researchers wanted to determine the usefulness of full-argument sentences and argument-omitted sentences in object case-marker learning. However, in experiment 2, we investigated this question by giving both full-argument and argument-omitted sentences to participants and manipulated the input frequencies of the two types of sentences to determine which was more effective.

3. Experiment 1
3.1. Method

Twenty-two 7-year-old (M = 7;5, range = 7;2–7;11) Japanese-speaking children participated in this experiment. For stimuli, we used both auditory and visual stimuli. For auditory stimuli, we used sentences where two non-lexical syllables were presented, po and bi (artificial case-marking), which referred to subject and object, respectively. Full-argument sentences (S-O-V: “saru-po ushi-bi oshiteiruyo: monkey-NOM cattle-ACC pushing”) and argument-omitted sentences (S-V: “saru-po oshiteiruyo: monkey-NOM pushing”, O-V: “ushi-bi oshiteiruyo: cow-ACC pushing”) were used to teach case-markers to the
participants. For visual stimuli, animal videos (i.e., animals performing actions) were presented during both the learning and test phases. For instance, in the learning phase, a video showing a monkey pushing a cow was presented. In the test phase different animal pairs (e.g., rabbit-bear, elephant-tiger and panda-lion) with different actions (e.g., kick and pull) were presented (see Table 1). We taught children the artificial case-markings po and bi in two types of argument structures: (a) full-argument sentence that can utilize word order and (b) argument-omitted sentence that cannot utilize word order.

Table 1. Representative set of stimuli

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Learning</th>
<th>Posttest</th>
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</table>
| Audio stimulates | OSV: lion-ACC panda-NOM kick-prog  
(The panda is kicking the lion) | **Full-argument sentence** (SOV): sarusan po ushisan bi oshiteruyo! monkey-NOM cow-ACC push-prog 
The monkey is pushing the cow! | OSV: lion-ACC panda-NOM kick-prog  
(The panda is kicking the lion) |
| Video Clip     |                          | **Argument-omitted sentence** (SV/OV): sarusan po oshiteruyo! monkey-NOM push-prog 
The monkey is pushing!  
ushisan bi oshiteruyo! cow-ACC push-prog 
The monkey is pushing! |                          |

In the experiment, participants initially completed forced-choice discrimination of scenarios by listening to eleven sentences (Eight O-bi-S-po-V sentences as a pre-test, and one sentence for each of these as a filler sentence: S-po-V, O-bi-V, S-po-O-bi-V). Then, they watched and imitated single-action-scenarios while listening to sentences where two non-lexical syllables were presented, po and bi, which referred to agent and patient, respectively. Half of the population sample learned full-argument sentences, and the other half learned argument-omitted sentences. After this, participants completed forced-choice discrimination of scenarios by listening to eleven sentences as a post-test, which was the same as the pre-test (See Table 1).

3.2. Results

The correct and incorrect choices were analyzed group by group using Generalized Logistic Mixed Effects Models (GLME). Fixed factors are learning conditions (full-argument condition and argument-omitted condition) and the timing of the test (pretest and posttest). On the other hand, random factors are participants and items. The results were shown in Figure 1.
There were significant differences between pre-test and post-test in argument-omitted sentence condition ($\beta = -3.14$, $SE = 0.83$, $z = -3.79$, $p < .001$), but not in full-argument condition ($\beta = -0.27$, $SE = 0.73$, $z = -0.37$, $p = .709$). The results indicated that, children are able to learn case markers through argument-omitted sentences, but are unable to learn this knowledge by being exposed to full-argument-sentences.

4. Experiment 2

4.1. Method

Forty-eight 7-year-old ($M = 7;5$, range = 6;10-7;11) Japanese-speaking children participated in experiment 2. The materials and procedures from experiment 1 were used but we manipulated the input frequencies between two groups. The first group called 20%-condition, which exposed four argument-omitted sentences (e.g., two OV sentences and two SV sentences) to the participants, and included 8 full-argument sentences (e.g., the occurrence of case-marker *bi* in full-argument sentences are 80% and in argument-omitted sentences are 20%). The second group called 80%-condition, taught sixteen argument-omitted sentences (e.g., eight OV sentences and eight SV sentences) to participants and included two full-argument sentences (e.g., occurrence of case-marker *bi* in argument-omitted sentences are 80% and in full argument-sentences are 20%). Aside from the learning phase, the procedure is different from the experiment 1 see Table 2 below.
Table 2. Representative set of stimuli for learning phrase

<table>
<thead>
<tr>
<th>Audio stimulates</th>
<th>Learning</th>
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<tbody>
<tr>
<td><strong>20%-condition</strong></td>
<td><strong>Argument-omitted sentence (SV/OV): 20%</strong></td>
</tr>
<tr>
<td>SV: <em>sarusan po oshiteruyo!</em></td>
<td>monkey-NOM push-prog</td>
</tr>
<tr>
<td>The monkey is pushing!</td>
<td></td>
</tr>
<tr>
<td>OV: <em>ushisan bi oshiteruyo!</em></td>
<td>cow-ACC push-prog</td>
</tr>
<tr>
<td>The monkey is pushing!</td>
<td></td>
</tr>
<tr>
<td><strong>Full-argument sentence (SOV): 80%</strong></td>
<td><em>sarusan po ushisan bi oshiteruyo!</em></td>
</tr>
<tr>
<td>monkey-NOM cow-ACC push-prog</td>
<td></td>
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<tr>
<td>The monkey is pushing the cow!</td>
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| **80%-condition** | **Argument-omitted sentence (SV/OV): 80%**  |
| SV: *sarusan po oshiteruyo!* | monkey-NOM push-prog  |
| The monkey is pushing!  |
| OV: *ushisan bi oshiteruyo!* | cow-ACC push-prog  |
| The monkey is pushing!  |
| **Full-argument sentence (SOV): 20%** | *sarusan po ushisan bi oshiteruyo!*  |
| monkey-NOM cow-ACC push-prog  |
| is pushing the cow.  |

In the experiment, first, participants completed forced-choice discrimination by listening to eleven sentences that was repeated as demonstrated in experiment 1. Then, they watched and imitated single-action-scenarios while listening to sentences where two non-lexical syllables were presented, *po* and *bi*, which referred to agent and patient, respectively. Half of the population sample learned *po* and *bi* as a 20%-condition, and the other half learned those case-markers as an 80%-condition. After this, participants completed forced-choice discrimination of scenarios by listening to eleven sentences as a post-test, which was same as the pre-test. We compared the effectiveness of learning case-markers between the two groups.

Our prediction for experiment 2 was that, if input frequencies of effective sentences affect case-markers learning, effective sentences (i.e., argument-omitted sentence) need to appear in the input frequently. With this, children who learned case-markers in 80%-condition would comprehend case-markers better than children who learned case-markers in 20%-condition.
4.2. Results

The correct and incorrect choices were analyzed group by group using Generalized Logistic Mixed Effects Models (GLME). The fixed factors are learning condition (20%-condition and 80%-condition) and the timing of the test (pre-test and post-test) while the random factors are participants and items. The results were shown in Figure 2.

Figure 2. Mean proportion of points to the correct scene

There were significant differences between pre-test and post-test in both 20% and 80% condition (20%-condition: $\beta = 1.69, SE = 0.71, z = 2.37, p = .017$, 80%-condition: $\beta = 3.00, SE = 0.59, z = 5.04, p < .001$). The results indicated that, children could learn case markers through the input that has both 80% and 20% argument-omitted sentences.

Figure 3 shows the results of experiment 1 and experiment 2. In the argument-omitted 0%-condition, where there were no argument-omitted sentences between pre-test and post-test ($\beta = -0.27, SE = 0.73, z = -0.37, p = .709$), children cannot learn object case-markers. However, in the argument-omitted 20%-condition, 80%-condition and 100%-condition, there were significant difference between pre-test and post-test (For 20% argument-omitted sentences: $\beta = 1.69, SE = 0.71, z = 2.37, p = .017$, 80% argument-omitted sentences: $\beta = 3.00, SE = 0.59, z = 5.04, p < .001$), and 100% argument-omitted sentences: $\beta = -314, SE = 0.83, z = -3.79 p < .001$). The results also suggest that the more the argument-omitted sentences are presented in the learning phase, the better comprehension performance is achieved in the post-test when compared to the results of the pre-test.
Proportion of points of the corrective scene

Learning condition

<table>
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<th>Pretest</th>
<th>Posttest</th>
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<tr>
<td>0%</td>
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<tr>
<td>20%</td>
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<tr>
<td>80%</td>
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<tr>
<td>100%</td>
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Figure 3. Mean proportion of points to the correct scene (experiment 1 and 2)

5. General Discussion

In this study, we investigated two questions:

1. What kind of sentences – full-argument sentence or argument-omitted sentence – are effective for children to acquire object case-markers?
2. How does input frequency affect children's ability to learn case-markers?

To answer the first question, we found that argument-omitted sentences are more effective than full-argument sentences for Japanese monolingual children in learning object case-markers. For the second question, we found both 80% and 20% are effective for case-markers learning.

With regards to the results of experiment 1, the reason why argument-omitted sentences are effective for children to learn case-markers is discussed. We considered the role of word order in transitive sentences. When children heard “panda po lion bi ketta,” they were able to understand the sentence without paying attention to case-markers. Therefore, they cannot learn case-markers in full-argument sentences, which contain word order information. As mentioned in section 2, previous studies found that children from age two start to utilize word order to identify subjects and objects in sentences (e.g., Gertner et al., 2006; Hayashibe, 1975). Hayashibe (1975) examined whether or not
Japanese-speaking three-year-olds, four-year-olds and five-year olds understand the notion of subject and object. In the experiment, they were asked to comprehend noun-noun-verb [NNV] transitive sentences. For the results, they found that three-year-olds and four-year-olds interpret the first noun as the subject and the second noun as the object even though the first noun was marked by object the case-marker wo. It indicated that children tend to understand NNV sentences by word order knowledge. Similar to Hayashibe’s study, our participants also utilized word order knowledge to comprehend NNV sentences, which used artificial case-makers. On the other hand, argument-omitted sentences allow children to pay attention to the target item (case-marker) and utilize case-makers to understand sentences, because paying attention to the case-marker is the only way to understand the sentence. For example, if children do not pay attention to bi when they hear the “lion bi ketta”, they cannot understand the sentence. But if they pay attention to bi, and map the sentence to the event, it will help them understand the sentence. In this case, paying attention to the case-marker is the only way to understand the sentence, so, children can learn the case-marker by utilizing argument-omitted sentence.

For the results of experiment 2, both 80% and 20% conditions are effective for case-makers learning. Specifically, this suggests that children are able to learn object case-makers even if argument-omitted sentences appear less frequently during daily interactions. This question why children can learn case-makers from the input where effective sentences don’t appear at 100%? It is probably related to children’s ability to focus on the most reliable or regular sources of structure and learn the correct rules from the input that has ineffective information. The results found in previous literature and the current study seems to suggest that children have the ability to focus on the most reliable structure. For example, Singleton & Newport (2004) examined whether a deaf child named Simon who was exposed to ASL with incorrect usages, can learn correct rules. His ASL exposure primarily comes from non-native parents. Specifically, they examined Simon's performance at age 7 on an ASL morphology task, compared with eight children who have native signing parents, and also compared with Simon's own parents. The results found Simon can learn ASL from his parents' input, which has incorrect usage. For instance, when the parents have 25-31% errors of their morphemes usage, Simon only has 9-16%. This result suggested even though parents make a lot of errors, the child could learn the correct form from these input. As a result, the child makes fewer errors than their parents.

Given the fact that deaf children can focus on the most reliable or regular sources of structure and learn the correct rules of use from an input with ineffective information, Japanese-speaking children could also do the same – to focus on the most reliable information (argument-omitted sentence) and learn case-makers in an input with ineffective information.
6. Conclusion

The present study investigated how Japanese-speaking children learn object case-markers. Specifically, the study investigated how argument-omitted sentences affect children’s case-marker learning. Through the artificial case-marker experiment, we found that the argument-omitted sentence is an effective information for children to learn case-markers. That is because children seem to pay more attention to case-markers in these types of sentences. In terms of input frequencies and argument-omitted sentences, we found that both 80% and 20% conditions were effective for case-markers learning, as children have an ability to focus on the most reliable and effective information in these forms of sentences.

These results imply two things: (1) the full-argument sentence is not always effective for language learning, and, (2) even though there is few effective input, argument-omitted sentence works well for language learning.

References


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