

SECOND LANGUAGE LEARNERS' USE OF GOOD-ENOUGH REPRESENTATION IN GRAMMATICAL PROCESSING*

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ABSTRACT

Second language learners' (hereafter L2ers) first language backgrounds, exposure to L2 input, and cross-linguistically common patterns often play a vital role in their construction of grammatical representations in L2 acquisition. The current study investigates how these factors exert an impact on native speakers from typologically different Mandarin Chinese, English, and Japanese in their comprehension of four types of Mandarin transitive constructions: the SVO, the *ba*-, the subjectless *ba*-, and topicalization constructions with pseudo verbs, every one of which has its respective frequencies when the animacy cue is neutralized. The results indicate that all of these language users use a good-enough representation that treats the first noun as the agent in grammatical processing, the NVN strategy. Employment of this representation leads to a similar performance for all but the topicalization construction, regardless of the construction frequencies. L1 backgrounds and L2 input exert impact on topicalization, which is non-canonical in Mandarin, apart from the NVN strategy.

Key words: Chinese, comprehension, English, Japanese, syntax

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1. INTRODUCTION

When second language learners (hereafter L2ers) are comprehending sentences, the nature of the outcome is likely to be affected by their first language (hereafter L1) comprehension strategies, the input characteristics of the grammatical constructions in the second language (hereafter L2), and the universal representation of syntax (Ionin, 2008). As a result, their comprehension is likely to deviate from the native norms (Clahsen & Felser, 2006). To tackle this issue, the current study investigated two groups of L2ers, English and Japanese native speakers studying Mandarin as their second language, and how they comprehended the Mandarin transitive constructions: the SVO construction, the *ba*-construction, the subjectless *ba*-construction, and the OSV/topicalization construction with pseudo verbs, and how the aforementioned factors may affect their grammatical processing in their second language.

Different theoretical perspectives hold different views as to how these three major factors can affect L2ers' comprehension of L2 grammatical structures. The following introduces three opposing views to serve as the background as to how English and Japanese native speakers' comprehension of the Mandarin transitive constructions may shed light on the broader picture of grammatical processing in second language acquisition.

2. LITERATURE REVIEW

Researchers in second language acquisition (hereafter SLA) who employ the framework of the Competition Model consider L1 transfer and L2 input as vital factors for L2ers' construction and use of syntactic representation in L2 grammatical processing (Bates & MacWhinney, 1981; Gass, 1987; Liu, Bates, & Li, 1992; Li, Bates, & MacWhinney, 1993; McDonald, 1987; MacWhinney, 2009; Morett & MacWhinney, 2013). The impact of these two factors can be formulated and discussed in terms of relative cue strengths with respect to L2ers' native language and second language. The strengths of cues are usually evaluated in

terms of cue availability, cue reliability, and cue validity. Cue availability refers to the frequency of a particular cue, which is present when a grammatical function is concerned, and cue reliability refers to the case when a relevant cue is present, and this cue can correctly identify a certain grammatical function. Cue validity is the product of cue availability and cue reliability. For example, if we want to determine the cue validity of “the first noun phrase (NP) that denotes the agent function” in a string consisting of two NPs in English, we must first determine the frequency of the utterances that have two NPs, which may include NVN, NNV, and VNN, namely the cue availability. Among these two-NP utterances, the first NP that denotes agent is calculated, namely the reliability of NNV and VNN word orders whose first NPs are the patient rather than the agent. Therefore, the cue reliability of the NVN where the first N refers to the agent will be $NVN/(NVN+NNV+VNN)$. Then, the cue validity of “the first NP that denotes agent function” is obtained by multiplying the cue availability and **the** cue reliability calculated above. That is, the cue validity of this is availability of NVN * First N as agent in $NVN/(NVN+NNV+VNN)$.

MacWhinney (1987;2009) and Morett and MacWhinney (2013) argued that when L2ers are processing sentences at their initial stage of L2 acquisition, their processing is often influenced by the cue strengths in their L1. That is, the dominant use of cues in L1 carries over to their L2 processing, leading to “syntactic accent.” When learners acquire their L2 gradually and incrementally, the cue reliability and cue validity of L2 constructions emerge to take over the L1 processing strategies, leading to a more native-like performance. A dominant cue refers to the case when several cues compete for a certain function, and this cue wins over the remaining cues. For example, when English speakers are confronted with a semantically anomalous sentence “*The pencils hit the dog”, they tend to choose the preverbal NP, the pencil, to be the doer/agent, rather than the animate entity, the dog. This indicates that English speakers use word order cue over the animacy cue to identify agent and therefore, word order is a dominant cue.

McDonald (1987) reported that the grammatical processing of English-Dutch bilinguals follows such a prediction in that their uses of cues changes in accordance with L2 cue strengths. When processing a

sentence, English speakers use word order cue predominantly, while Dutch speakers use case inflection dominantly. He found that when Dutch speakers are exposed to English for an average of one year, their reliance on the word order to identify the agent in grammatical processing can explain about 20% of statistical variance, whereas their reliance on word order cue increased to explain 90% of statistical variance after exposure to English for an average of 11 years. When English speakers are exposed to Dutch for an average of 2.8 years, their reliance on case inflection can only explain less than 10% of statistical variance in grammatical processing, but their reliance on case inflection increased to explain 45% of statistical variance after exposure to Dutch for an average of 18.2 years.

Morett and MacWhinney (2013) investigated the agent identification of Spanish-English bilinguals and confirmed such a developmental trajectory in L2 grammatical processing. They found that interaction between L1 transfer and L2 cue validity and reliability is pronounced when non-canonical word order such as NNV and VNN are considered (both English and Spanish have the NVN word order as the predominant word order, but Spanish relies more on animacy for thematic role identification than does English). They reported that more advanced English L1 Spanish L2 speakers rely on animacy cues more than less advanced English L1 Spanish L2 speakers as these less advanced speakers use L1-English strategies in interpreting sentences. In addition, all of the English L1 Spanish L2 learners showed a heavy reliance on Spanish prepositional case marking as a cue to identify the patient, regardless of proficiency, indicating L2ers' heavy reliance on cue reliability where such patient case marking reliably identifies the patient.

In contrast with the Competition Model, the shallow structure hypothesis (hereafter SSH) proposed by Clahsen and Felser (2006) argued that native speakers and L2ers employ qualitatively different mechanisms in grammatical processing and discard the roles of L1 transfer and L2 input characteristics. They claimed that native speakers employ a deep and detailed representation of syntax, whereas L2ers employ a shallow and less-detailed one for grammatical processing, regardless of facilitation from their L1 background and exposure to L2 input, namely levels of proficiency. Their claims were primarily based on studies of L2ers from different L1 backgrounds and of L2ers of an advanced level of

proficiency in comprehending syntactic ambiguities in relative clause attachment as in (1a) and (1b) (Papadopoulou & Clahsen, 2003).

- (1) a. Someone saw the servant **of** the actress who was on the balcony.
(genitive)
b. Someone saw the servant **with** the actress who was on the balcony.
(thematic)

For example, in processing (1a), English native speakers tend to disambiguate the relative pronoun *who* to identify the second NP, *the actress*, while Greek native speakers tend to disambiguate the relative pronoun to identify the first NP, *the servant*, to be the subject of the following relative clause. Papadopoulou and Clahsen (2003) asked highly proficient English L2ers whose L1 backgrounds were Greek and German, both of which languages use the first NP to be the subject of the following clause, to process (1a) and also highly proficient Greek L2ers whose L1 backgrounds were Spanish, German, and Russian, all of which use the first NP to be the subject of the following relative clause as well. They found that regardless of the L2ers' L1 backgrounds and levels of proficiency, these L2ers showed no preferences for using the first NP or second NP to identify the relative pronoun, *who*, as the subject of the following relative clause even though Spanish, German, and Russian L1ers side with their Greek L2 in this identification. A similar performance was obtained in the case of Greek L1 English L2 and of German L1 English L2. In contrast, when these L2ers were processing (2), they all chose the second NP to be the subject of the following clause. Clahsen and Felser (2006) argued that this choice can be explained because a sentence like (1a), using the preposition *of*, does not have a semantic cue, whereas a sentence like (1b), using the preposition *with*, does indicate a thematic relation. While native speakers can employ a structure-based representation for the interpretation in (1a) and a semantics-based one for (1b), L2ers can only use a semantics-based representation to interpret (1a) and (1b). As a result, different results in performance were obtained between native speakers and L2ers.

Marinis, Roberts, Felser, and Clahsen's (2005) study which examined English L2ers whose L1 backgrounds are Greek, German, Chinese, and

Japanese in processing (2a) and (2b) led to a similar conclusion as that given above.

- (2) a. The nurse who the doctor argued ____ that the rude patient had angered ____ is refusing to work late. (intermediate gap)
b. The nurse who the doctor's argument about the rude patient had angered ____ is refusing to work late. (no intermediate gap)

They found that all of the participants took a longer time to read (2a) and (2b) in the extraction position, the position after the subcategorizing verb, *angered*, than to read the control conditions that contained no extractions. However, they found that only English native speakers exhibited a sign of processing this intermediate gap, as indicated by an extraction position by phrase type interaction effect. They took less time to read the sentence that contained an intermediate gap as in (2a) than those that did not contain an intermediate gap as in (2b), while the results for L2ers did not demonstrate this interaction effect. Clahsen and Felser (2006) again argued that it is native speakers who can employ a deep and detailed representation to make use of the immediate gap to integrate the moved element, namely a filler such as *nurse*, with its subcategorizing verb, namely *angered*, whereas L2ers cannot because they tended to rely on semantic information such as the verb alone.

Nevertheless, Clahsen and Felser (2006) are aware that their claim is too overreaching because even native speakers do not always use a fully-constructed and detailed syntactic representation in comprehension, particularly in the case of non-canonical sentences (Ferreira, 2003). Ferreira (2003) argued that while language learners in comprehending language avail themselves of a deep representation computed fully for sentence meaning, namely algorithm, at the same time, in many cases among native speakers, comprehension is shallow and incomplete, i.e., language speakers tend to use quick and dirty heuristics for sentence comprehension (Townsend & Bever, 2001). She investigated English native speakers' comprehension among these conditions that crossed three major factors: plausibility, e.g., "the man bit the dog vs. the dog bit the man", reversibility of the NPs, e.g., "the cheese ate the mouse vs. the mouse ate the cheese" and constructions with different surface

frequencies, e.g., active, passive, subject cleft sentences, and object cleft sentences. The results indicated that the plausibility and reversibility of the NPs did not affect the speakers' comprehension of the construction types with canonical word order, namely active and subject cleft constructions, significantly, regardless of the surface frequency. Although the active and subject cleft differ significantly in their surface frequency, speakers did not comprehend them differently, and nor did they comprehend the plausibility and reversibility of the NPs differently. By contrast, the plausibility and reversibility of NPs affected speakers' comprehension of the construction types with a non-canonical word order, namely the passive and object-cleft sentences. She argued that it is the NVN strategy, which treats the first NP as agent and second NP as patient, which guides the parser to a quick decision for sentence comprehension, but which also leads to errors in the choice of the type of construction with a non-canonical word order. If this is the shallow representation, termed as good-enough representation by Ferreira, that is used by native speakers, and if Clahsen and Felser's (2006) claim that L2ers tend to use shallow representation in comprehending their second language is correct, then this good-enough representation may be a universal representation of syntax that is independent of languages and of constructions with variations in surface frequencies. The current study investigated two groups of native speakers: English and Japanese speakers across three levels of proficiency to see how they comprehended the following four Mandarin transitive constructions with pseudo verbs when the animacy cue is neutralized in NPs and how the results can be employed to tease apart the predictions which are derived from the three theoretical frameworks introduced above.

As Mandarin Chinese has long been considered an isolated language whose morphological system is impoverished (Li, et al., 1993), it is subject to debate whether Mandarin has an explicit case system as Indo-European languages such as German or Greek do. Nevertheless, Chinese linguists (Li, 1990; Li et al., 1993; Huang, Li, & Li, 2009) argue that Mandarin Chinese has a case system at a more abstract level, which is usually not realized morphologically and phonetically because the existence of such a case system allows linguists to account for linguistic data practically and theoretically (Li, 1990). Within such circumstances,

ba as an object case marker stands as one exception to this impoverished system. Following this type of formulation of the case system in Mandarin, an SVO construction *xiaogou tuidaole xiaomao* “A little dog pushes a little cat down.” which consists of subject, verb compound and object in (3) is parallel to English SVO constructions such as “The dog pushes the cat.” where “the dog” takes the nominative case and “the cat” takes the accusative case.

- (3) Xiaogou tuidaole xiaomao. SVO word order
Little dog push down-ASP little-cat
'A little dog pushes down a little cat.'

A *ba*-construction *xiaogou ba xiaomao tuidaole* “A little dog pushes a little cat down.” that consists of subject, an object case marker *ba*, an object, and a verb compound is illustrated in (4). In contrast to the typical Mandarin word order (Sun & Givon, 1985), the Mandarin *ba*-construction has an SOV word order.

- (4) Xiaogou ba xiaomao tuidaole. SOV word order
Little dog BA little cat push down-ASP
'A little dog pushes a little cat down.'

Since Mandarin Chinese is a language with massive noun ellipsis, particularly for the subject (Chan, Lieven, & Tomasello, 2009; Li et al., 1993), a *ba*-construction without the subject *ba xiaomao tuidaole* “Something/someone pushes a little cat down.” which consists of the objective *ba* marker, the object, and the verb compound illustrated in (5) still allows a Mandarin speaker to distinguish who is the doer and who is the doee, i.e., the *ba*-marked NP is the doee.

- (5) Ba xiaomao tuidaole. OV word order
BA little cat push down-ASP
'Something/someone pushes a little cat down.'

A topicalization construction in Mandarin Chinese is *xiaomao xiaogou tuidaole* “A little dog pushes a little cat down.” which consists of object,

subject, and the verb compound in that order as illustrated in (6a), i.e., an OSV word order. In line with the hypothetical presence of an abstract case system in Mandarin Chinese (Li, 1990), speakers of Mandarin can identify that the second NP, which is closer to the verb, is the subject/agent of the action while the first NP is the object/patient of the action, but such identification is particularly transparent when animacy is contrasted as in (6b).

- (6) a. Xiaomao xiaogou tuidao-le. OSV word order
Little cat little dog push down-ASP
'A little dog pushes a little cat down.'
b. Zhuozi xiaogou tuidao-le.
Desk little dog push down-ASP
'A little dog pushes down a desk.'

Using these four Mandarin transitive constructions allows us to tease apart the predictions that are derived from the three theoretical frameworks as follows. First, Mandarin Chinese is a well-known argument-ellipsis language (Chan et al., 2009; Li et al., 1993). How massive argument ellipsis affects English and Japanese native speakers' comprehension of these transitive sentences is still unclear because English is a language whose arguments need to be realized obligatorily whereas Japanese sides with Mandarin Chinese and also allows massive argument ellipsis. Second, this study attempts to shift the focus of earlier studies in Mandarin L2 studies, which often draw attention to how animacy affects sentence comprehension, probably because Mandarin is considered an animacy-dominated language (Liu et al., 1992; Su, 2001a; 2001b), to an investigation of how Mandarin L2ers process structural information, i.e., when the animacy information is neutralized and pseudo verbs are used in sentence comprehension. If it is syntactic representation that is being investigated in comprehension, it had better make the processing more syntactic. Since animacy is a semantic cue and past experiences of verbs usually can exert an impact on syntactic comprehension (Boland, Tanenhaus, Garnsey, & Carlson, 1995; Gahl & Garnsey, 2004; Garnsey, Pearlmutter, Myers, & Lotocky, 1997; Hare, McRae, & Elman, 2003; Traxler, Williams, Blozis, & Morris, 2005), the

neutralization of animacy and the employment of pseudo verbs maximizes the investigation of L2ers' employment of syntactic representations in comprehension. Third, the selection of English and Japanese native speakers across three levels of proficiency, i.e., elementary, intermediate, and advanced allows us to investigate how L1 transfer and L2 input characteristics such as cue strength influence the development of these Mandarin L2ers' syntactic representations. There are several ways to characterize the exposure of learners to an L2, including the number of hours they take for L2 languages, the length of residence, the interaction with the L2 native speakers, and their levels of proficiency. Of these, level of proficiency seems to be the best indicator to measure how L2ers have absorbed in their acquisition of the L2 (Jarvis & Palenko, 2007). This study draws on the level of proficiency as an independent variable for the exposure of Mandarin L2ers to input.

On the other hand, Bates and MacWhinney (1989) have reported that English adult native speakers employ word order as a dominant cue followed by VOS, OSV > Animacy, Agreement > Stress, Topic when identifying the agent of the sentence. In contrast, Japanese adult native speakers use case as a dominant cue followed by Animacy > SOV to identify the agent thematic role. Mandarin speakers tend to use animacy as a dominant cue followed by the SVO word order cue. If L1 transfer occurs when these two groups of native speakers are learning Mandarin across different levels of proficiency, it is expected that L1 transfer and the cue strength in L2 Mandarin may play a vital role in their comprehension from the perspective of the Competition Model. When they are exposed to Mandarin more, cue validity and cue reliability will guide their comprehension for these four Mandarin transitive constructions. It is found that the strength of the cue reliability of these four transitive constructions when the animacy cue is neutralized is *ba*-construction = subjectless *ba*-construction > SVO construction > topicalization/OSV construction and the strength of the cue validity is SVO construction > *ba*-construction = subjectless *ba*-construction > topicalization/OSV construction (Hsu, 2014 a; b). Therefore, when English L1 Mandarin L2ers (hereafter E1M2) are exposed to Mandarin more, i.e., proficiency improves, their comprehension should follow the aforementioned Mandarin cue validity or cue reliability as listed above. By the same token,

Japanese L1 Mandarin L2ers (hereafter J1M2) will comprehend *ba*-construction =subjectless *ba*-construction > SVO > topicalization/OSV construction as they will treat the OSV construction as a Japanese SOV construction, leading to poorer performance. When their level of proficiency improves, they tend to comprehend the Mandarin transitive constructions on the basis of the cue validity or cue reliability of these constructions. In addition to the respective frequency of each construction of these transitive constructions, these four constructions allow us to investigate how the number of cues may influence speakers' comprehension. Bates and MacWhinney (1989) argued that the cue-in-coalition construction, i.e., multiple cues converging to identify one function, can be comprehended better than the cue-in-conflict construction, i.e., different cues supporting different entities in the construction for a specific function. For example, the *ba*-construction is an example of a cue-in-coalition construction among the four because the word order cue and the objective case *ba* both support the first NP as agent while the topicalization/OSV construction is an example of cue-in-conflict construction because the word order cue supports the first NP as agent, but the abstract case supports the second NP as the agent. Following this line of thinking, speakers may comprehend the *ba*-construction better than the SVO and the subjectless *ba*-construction, because the SVO and the subjectless *ba*-constructions have only one cue, word order for the SVO and the objective case for the *ba*-construction. Their comprehension of these three types should be better than that of the topicalization/OSV construction which is a construction with cue-in-conflict. To make a quick generalization of the predictions above, both the Competition Model and the Good-enough Representation account proposed by Ferreira (2003) agree that participants will perform worst when comprehending the OSV/topicalization construction, whereas the Competition Model will predict that Mandarin users, including native speakers, will comprehend SVO and the *ba*-construction (and the subjectless *ba*-construction) differently, while the Good-enough Representation account predicts that SVO and the *ba*-construction (including the subjectless *ba*-construction which implies an implicit first NP as agent) will be comprehended equally well by the Mandarin users.

On the other hand, SSH (the shallow structure hypothesis) may merely

predict that these two groups of Mandarin L2ers will never achieve native-like comprehension regardless of their L1 backgrounds or levels of proficiency. The Good-enough Representation account predicts that these two groups of L2ers should use NVN heuristics to treat the first NP as agent and the second NP as patient to comprehend the four types of transitive constructions throughout the development of their L2 syntax. As a result, these two groups of Mandarin L2ers will comprehend the SVO construction as well as the *ba*-construction, but make misinterpretation errors in the case of the OSV/topicalization construction. They may tend to comprehend the subjectless *ba*-construction gradually, as well as the *ba*-construction, as they detect the function of the objective marker of *ba*.

The following presents three experiments to investigate how native speakers of Mandarin, English, and Japanese comprehend the aforementioned four types of transitive constructions with pseudo verbs when the animacy cue is neutralized.

3. EXPERIMENT 1: MANDARIN NATIVE SPEAKERS

Researchers have long employed ideas that are derived from the Competition Model to investigate how Mandarin native speakers employ various cues to comprehend different types of Mandarin transitive constructions (Li et al., 1993; Liu et al., 1992; Miao, 1981; Miao, Chen, & Ying, 1986; Su, 2001a; 2001b; 2004). In a relatively large-scale study, Li et al. (1993) employed intrasentential cues such as the passive marker *bei*, animacy, word order, the object marker *ba*, and the indefinite marker *yi*, “one,” to examine how Mandarin speakers comprehend the transitive constructions, i.e., the rates for these participants to identify the first NP as the agent in constructions like the SVO construction, the *ba*-construction, the *bei*-construction/passive construction, and the topicalization/OSV construction in Mandarin. They found that the hierarchy of cue strength in Mandarin is passive marker *bei* > animacy > word order > object marker *ba* > indefinite *yi*, “one”. Su’s studies (2001b; 2004) further investigated how extrasentential cues such as context or discourse information can influence first NP (NP1) choice for the Mandarin canonical SVO,

topicalization, and VNN constructions. They have consistently reported that Mandarin is an animacy-dominant language unlike English, which employs structural cue, namely word order for comprehension. Nevertheless, this experiment attempts to investigate native speakers' comprehension of the four types of transitive constructions: the SVO construction, the *ba*-construction, the subjectless *ba*-construction, and the topicalization/OSV construction with pseudo verbs when the animacy cue is neutralized. Animacy is a semantic cue, which is easily influenced by the world knowledge held by the speakers. For example, the relationship between two NPs and the verb in Mandarin, e.g., *qiche zhuan laoshi* 'The car hit the teacher' versus *qiqiu la houzi* 'The balloon pulls the monkey' may lead Mandarin native speakers to choose the first inanimate NP *qiche* 'the car' as the agent, whereas they may choose the second animate NP *houzi* 'the monkey' as the agent. The results indicate that even though both are I(nanimate)verbA(nimate) utterances, native speakers show a different performance in the two sets of responses, which were severely biased by their world knowledge. This type of bias may be extended to other syntactic constructions, which were investigated earlier when animacy cues are not controlled. The neutralization of the animacy cue on the NP and the usage of pseudo verbs permits a better investigation of speakers' employment of syntactic or structural representation of the comprehension of these four types of constructions and thus allows us to tease apart the predictions laid out earlier.

3.1 Method

Participants. Twenty-eight adults (range=20-38, Mean age = 25, SD=4.88, 14 male and 14 female) participated in a language comprehension task using a forced choice pointing paradigm (FCPP). All were speakers who were dominant in Mandarin Chinese and had no language difficulties. They were recruited at two national universities in Taipei, Taiwan. All of the participants were tested in sound-dampened locations either in the labs or classrooms at the two national universities. After the experiment, these participants were each paid NT\$100.

3.2 Materials, Design, Counterbalancing, and Procedure

All of the verbs referred to prototypical causative-transitive actions with a clear end point. These actions involved a volitional agent exerting an impact on a patient either using a tool or through direct contact. All of the actions were reversible. This permitted a manipulation whereby the two animal characters in the two synchronized animations could be flipped with identical actions. The four pseudo verbs *fo*, *pya*, *lei*, and *duain*, all of which have a first tone, were used to describe four pseudo transitive actions with a clear end state that were performed by two animal characters. *Fo* was used to refer to the action involved in an animal putting another animal on a crescent-like apparatus and picking up and throwing it so that it fell to the ground. *Pya* was used to refer to an animal putting another animal on a stool-like apparatus, lifting the apparatus, and then putting it down. *Lei* was used to refer to an animal pushing another animal standing on a turning ball and letting it fall. *Duain* was used to refer to an animal pulling down another animal which was standing on a rock by its leg to make it fall to the ground.

The agents and patients of a particular event were pairs of animals, all of which were familiar to all of the participants. These animals were a rabbit, hippo, dog, lion, cat, tiger, bear, and monkey. None of the participants showed any difficulty in identifying these animals. These animal characters were in cartoon animations, which were created in FlashPlayer, and exported as movies to Dreamweaver. The movies consisted of two synchronized animations side by side and were presented twice on a laptop. The events in the two synchronized animations are identical except when the animal characters were flipped.

The participants heard the same test sentences with the construction types counterbalanced (see Counterbalancing), which were recorded by a male native Mandarin Chinese speaker and exported into the Dreamweaver movies. Therefore, all of the participants heard four pseudo verbs, each paired with a type of transitive construction, the actions of which were demonstrated by two pairs of animal characters. That is, there were eight trials for the four pseudo verbs and the four types of transitive constructions. Participants in the test trial heard each of the following four types of constructions with the pseudo verbs, e.g., *xiaogou fole xiaomao*,

xiaogou ba xiaomao fole, and *xiaomao xiagou fole*, each of which can be translated in the same way as 'A dog foed a cat.' and *ba xiaomao fole* "Something foed a cat." In each test trial, the pseudo verb was paired with two sets of animal characters and for each set of animals, the sentence that described the event with this set of animals was presented twice in each of the four different types of Mandarin transitive constructions. For example, participants heard the pseudo verbs presented in the SVO construction such as *xiaogou fole xiaomao* "A dog foed a cat." and the sentence was repeated. After the presentation of each sentence, a prompt command such as *Zhizhe xiaogou fole xiaomao de difang* "Point at the location where a dog foed a cat." was given. After the presentation of the first set of animations, the second set of animations was paired with the same type of constructions and the test sentence was repeated.

The FCPP is a comprehension task based on pointing. Participants were required to point to one of the synchronized animations presented on the computer screen. Both involved animals enacting identical causative actions and differed only in that the agent and patient roles were reversed in one of the animations. In total, each participant completed an animal character identification stage, three screening trials, two real verb practice trials, and eight test trials. A camcorder was held by the experimenter next to the participants to record the action of their pointing with especial care not to record their faces.

The construction types were counterbalanced with each pseudo verb and therefore four lists were derived. The four lists were SVO-*ba*-(s)*ba*-OSV, *ba*-(s)*ba*-OSV-SVO, (s)*ba*-OSV-SVO-*ba*, and OSV-SVO-*ba*-(s)*ba*. The target side of the pointing was randomly determined for the four pseudo verbs within each list so that none of the lists had the same target sequences for these four types of transitive constructions. The participants were randomly assigned to one of four counterbalance conditions.

The testing took place in the three labs or classrooms at two national universities in Taipei. During all of the trials, the experimenters sat beside the participants to record the action of the participants' pointing and the participants were told to concentrate on listening to the sentences as they were played and to the movies on the computer screen. The order of the trials was as follows: animal character identification > pseudo verb

screening trials > real verb practice trials > test trials.

The experimenters told the adult participants that they were going to investigate how they comprehended the heard utterances. They were first shown an animation with eight animal characters (dog, cat, tiger, rabbit, bear, lion, hippo, and monkey) that were waving their hands and moving their legs. All of the participants correctly identified over 97 percent of the animal characters.

Following the identification of the animal characters, each participant completed three screening trials in a fixed order. The trial consisted of an animal performing a self-initiated action in one scene, while an animal was standing still in the other scene. The accompanying audio sentence was an intransitive sentence with a pseudo verb in its progressive aspect in Mandarin Chinese. For example, one trial consisted of a cat waving its hand in an S shape repeatedly in one scene, while another cat was standing still in the other scene and the participants heard an intransitive sentence *xiaomao zai kao-zhe* “A little cat is kaoing”, then *zhi zhe xiaomao zai kao-zhe de difang* “Point at the location where a little cat is kaoing.” All of the participants were encouraged to choose only one of the scenes, the one which they felt was the more appropriate of the two after they heard the sentence. If any of the participants hesitated to point at a scene, they were encouraged by the experimenters not to be afraid and received praise after they did the pointing. Other than this, no other input was given to these participants. The participant’s first point was always taken as the response. The arrangement of these trials was based on the suggestion of Noble, Rowland, and Pine (2011) to exclude participants who could not pass this simple screening test that required them to point to a scene where an animal is performing a self-initiated action. The participants needed to pass all of the three trials to pass this screening test.

The real verbs in the SVO construction were used in the familiarization trials. The real verb practice trials consisted of three synchronized movies using three real verbs, namely *mou* “touch”, *wei* “feed”, and *ti* “kick”. The movies always involved an animal performing a familiar action in regard to producing a physical change of state in the other animal in one scene, while the same animal performed a different action to produce a similar, but different effect in regard to the other animal in the other scene. For example, one of the movies involved a bear

pulling a hippo's hand in one scene, while a bear is feeding a hippo an apple in the other scene. The accompanying audio was of the sentence *xiaoxiong weizhe hema* "A little bear is feeding a hippo" and *zhi-zhe xiaoxiong weizhe hema de difang* "Point at the location where a little bear is feeding a hippo." Each of the participants completed three real verb practice trials in a fixed sequence.

After completing the three real verb practice trials, each participant completed eight pseudo verb test trials. These eight pseudo verb trials included the four types of transitive constructions. Each scene involved an animal performing a pseudo action in regard to the physical state of the other animal in one scene, while the semantic roles of the two animals were reversed in another scene with the identical action. Two scenes involving the same pseudo verb that denoted the same pseudo action with two different sets of animals were used for each type of transitive construction. For example, a tiger lifted up a lion which was standing on a table and then put it down in one scene, while a lion lifted up a tiger which was standing on a table and then put it down in the other scene. With the same identical action in the same pseudo verb, a lion lifted up a hippo, which was standing on a table and put it down in one scene, while a hippo lifted up a lion, which was standing on a table and put it down in the other scene. The accompanying audio sentences were *shizi ba laohu pyale* "A lion pyaed a tiger", *zhizhe shizi ba laohu pyale de difang* "Point at the location where a lion pyaed a tiger", and *hema ba shizi pyale* "A hippo pyaed a lion", *zhi-zhe hema ba shizi pyale de difang* "Point at the location where a hippo pyaed a lion." The remaining three novel actions/pseudo verbs were paired with the remaining three types of transitive constructions: SVO, subjectless *ba-* and topicalization constructions.

Although both the real verb practice trials and the test trials involved each of the two synchronized animations within a movie that had an animal (agent) performing a causal action in regard to the other animal (the patient), these two trials differed in the following points. First, all of the transitive constructions in the real verb practice trials used familiar verbs and the SVO construction only, whereas all of the movies in the test trials used pseudo verbs/ novel actions and, except for one pseudo verb that was paired with the SVO construction, the remaining three pseudo verbs were paired with other transitive constructions other than the SVO

construction. This arrangement can decrease the possibility that the effects obtained in the test trials are derived from the participation in the preceding real verb practice trials and not from the participants' general knowledge of syntax. Second, different familiar actions were used in each of the synchronized animations in the real verb practice trials, whereas identical novel actions were used in each of the synchronized animation in the test trials.

3.3 Analyses

For every test trial, the participants' first point in all of the trials was the recorded response. The data were coded by three trained coders and by the author of this paper. First, the total amount of the data was divided into three sets, and three trained coders each coded a different set of the data. 15% of three trained coders' data were randomly selected and were reliably rechecked by the author. Inter-rater reliability was 100%.

3.4 Results and Discussion

Table 1 displays the proportion of native speakers of Mandarin that chose the first NP as agent in the case of all of the four types of transitive constructions: the SVO construction, the *ba*-construction (SBAOV), the subjectless *ba*-construction (BAOV) and the topicalization construction (OSV) with the pseudo verbs when animacy on both NPs are neutralized, i.e., both are animate.

Table 1. Proportion of first NP choice among three languages

Language	Chinese	English			Japanese		
		Proficiency			Proficiency		
Construction	Native	High	Mid	Low	High	Mid	Low
SVO	.94	.96	.97	.78	.94	.98	.71
SBAOV	1	1	.97	.86	1	.95	.86
BAOV	.96	.96	.95	.72	1	.98	.67
OSV	.73	.75	.68	.56	.94	.79	.76

Table 1 indicates that these participants chose the first NP 94% of the number of occurrences of the SVO construction in the SVO construction, 100% of the instances of the *ba*-construction, 96% of the time in the subjectless *ba*-construction, and 73% of the time in the topicalization construction. To investigate whether the rates at which they chose the first NPs differ across these constructions, a four-level one-way ANOVA was employed. The independent variable is the type of construction (SVO vs. *ba* vs. subjectless *ba* vs. OSV) and the dependent variable is the proportion of the first NP choice across these four constructions. Since the participants were asked to make two choices for the same animation, their two choices were averaged as one value for the statistical analysis. If there existed a significant main effect for the type of construction, a Bonferroni post-hoc analysis would be applied.

The results indicated that there is a significant main effect of construction ($F_{(3, 108)} = 11.54, p = < .001$) and therefore a Bonferroni post-hoc analysis was applied. The post-hoc analysis reports that the significant main effect primarily comes from the OSV, which is different from the other three constructions (OSV-subjectless *ba*-construction, $p = < .001$, OSV-SVO, $p = < .001$, OSV-*ba*-construction, $p < .001$) and there is no difference in the N1 choice among the SVO construction, *ba*-construction, or the subjectless *ba*-construction (all $ps > .05$).

These results are in sharp contrast with the findings for native speakers' comprehension of the *ba*-construction (Li et al., 1993) and of the SVO and OSV construction (Li et al., 1993; Liu et al., 1992; Su, 2001a) when the animacy cue for the NPs was also neutralized. Such sharp contrast between the results for previous studies and the current one may be explained by the fact that the comprehension of native speakers of Mandarin is significantly influenced by their experience with the verb employed in the experiment, which is well-known as a key factor that affects sentence comprehension (Boland, Tanenhaus, Garnsey, & Carlson, 1995; Gahl & Garnsey, 2004; Garnsey, Pearlmutter, Myers, & Lotocky, 1997; Hare, McRae, & Elman, 2003; Traxler, Williams, Blozis, & Morris, 2005). The findings in this experiment did not support the predictions of the Competition Model because the respective frequency of each type of construction and the cue-in-coalition constructions such as the *ba*-construction did not exert an observable impact on the comprehension

of these speakers. However, the findings support the predictions of the Good-enough Representations in the following two ways. First, Ferreira (2003) argued that when comprehenders have no previous clues to rely on for sentence comprehension, they tend to employ NVN heuristics, i.e., treating the first NP as the agent and the second NP as the patient to process the incoming syntactic strings, regardless of the surface frequency of the constructions. Therefore, even if the frequencies of the *ba*-construction and of the subjectless *ba*-construction are both much lower than that of the SVO construction, Mandarin speakers do not comprehend them less well than the SVO construction. Second, due to their employment of the NVN strategy, Mandarin speakers tend to treat the first NP as an agent while computing the algorithm of the OSV construction in which the second NP is the agent. As a result, the employment of NVN strategies is weakened under such circumstances. Ferreira (2003) argued that cues such as animacy do not exert a great impact on (English) speakers' comprehension of the canonical SVO construction due to the application of the NVN strategy, whereas animacy comes into play when such speakers are processing the non-canonical constructions such as the passive construction or the object cleft construction in English where their application of NVN strategy may lead to errors. This may explain why previous studies report the strong tendency of Mandarin speakers to choose the animate NP as agent in the NNV word order (P. Li et al., 1993; Liu et al., 1992).

4. EXPERIMENT 2: NATIVE SPEAKERS OF ENGLISH

There are few studies that report how English native speakers employ syntactic or semantic cues to comprehend Mandarin constructions as a second language across different levels of L2 proficiency (Su, 2001a; 2001b) when compared with the vast number of studies that report the comprehension of speakers with various L1 backgrounds when studying English as a second language (Gass, 1987; Liu et al., 1992; Morett & MacWhinney, 2013; McDonald, 1987; Su, 2001a; 2001b; 2004). Su (2001a) investigated the developmental trajectory of E1M2ers in the formation of their comprehension of the Mandarin NVN and NNV

constructions when word order and animacy cues are concerned across three levels of Mandarin Chinese proficiency: beginning, intermediate, and advanced. She found effects for word order and for improvement of proficiency in their comprehension of Mandarin NVN (SVO) and NNV(OSV) constructions. She reported that English native speakers transfer their dominant strategy of word order to comprehend Mandarin constructions, regardless of proficiency level. Nevertheless, she also reported that animacy played a role in Mandarin NNV construction when the NNV construction consists of A(nimate)NP + I(nanimate)NP + Verb, e.g., *the mouse the window pushes*. She found that English speakers with intermediate and advanced levels of Mandarin Chinese chose animate nouns 80% and 73% of the time as opposed to 12% by native English speakers with no exposure to Mandarin. This result suggests that E1M2ers were influenced by Mandarin input as their level of proficiency increased. Although Su (2001b) also found that context effects can influence the choice of E1M2ers of N1 as an agent, i.e., when the context biases N2 to be agent when they are processing Mandarin SVO and OSV constructions when both NPs are animate, but she did not report how E1M2ers comprehend these two Mandarin constructions when both NPs are animate across the three levels of proficiency in her 2001a study. In short, Su (2001a; 2001b) outlined the importance of how semantic and pragmatic cues exert a significant impact on the comprehension of E1M2ers of Mandarin syntactic constructions. However, we have no idea how these L2ers form their syntactic representations or employ them in their comprehension of sentences or how their L1 dominant cue, namely word order, interacts with L2 input across the three levels of proficiency. This study attempts to bridge this gap by investigating the comprehension of E1M2ers of the four aforementioned transitive constructions using the cues of word order and case in Mandarin when both NPs are neutralized.

4.1 Method

Participants. Forty-eight English native adults (range=20-42, Mean age=26, SD=3.86, 20 men and 28 women) participated in a language comprehension task using a forced choice pointing paradigm (FCPP). There were 16 participants for each level of proficiency. All were speakers

who had first started to learn Mandarin Chinese after the age of eighteen and who had had no early exposure to Mandarin Chinese before they started learning it. They were recruited at two national universities, but primarily came from a Mandarin Training Center in one of the two national universities in Taipei, Taiwan. They were classified into three levels of proficiency either on the basis of the standardized tests of the HSK (Hanyu Shueiping Kaoshi) or the TOCFL (Test of Chinese as a Foreign Language) or by the passing grades of the courses they were taking. If they reported their standardized scores, their level of proficiency was assigned on the basis of the levels that the tests have given to them. If it was their course grades that were taken into consideration, the number of the textbooks in the series was used to assign their levels. The major assignment is based on the use of Shiting Huayu, Books 1-2 for elementary, Books 3-4 for intermediate, and Books 5-6 for advanced. However, for the elementary level of proficiency, the L2ers were restricted to those who took Lesson 10 in Book 1 and above in that it is sure that they would have some familiarity with the *ba*-construction. All of the participants were tested in sound-dampened locations in either labs or classrooms at the two national universities. After the experiment, these participants were each paid NT\$300.

4.2 Materials, Design, Counterbalancing, and Procedure

The materials, design, counterbalancing, and procedure in Experiment 2 were identical to those in Experiment 1: Native Mandarin Chinese speakers, except that the accuracy rate in the screening tests for the animal character identification phase was 90 percent, slightly lower than the accuracy rate of the native speakers of Mandarin for identification.

4.3 Analyses

The ways to code and analyze the data that were collected in this study were identical to Experiment 1. Inter-rater reliability was 100%.

4.4 Results and Discussion

The column titled English in Table 1 displays the proportion of native speakers of English who chose the first NP as the agent across the four types of transitive constructions: the SVO construction, the *ba*-construction (SBAOV), the subjectless *ba*-construction (BAOV), and the topicalization construction (OSV) with the pseudo verbs when the animacy on both NPs is neutralized, i.e., both are animate. It indicates that these participants chose the first NP in the four types of transitive constructions differently in the three levels of proficiency, particularly in the case of the Mandarin L2ers at the elementary level. 78%, 97%, and 96% of the time the 1st NP was chosen as the agent in the SVO construction by the elementary, intermediate, and advanced E1M2ers, respectively; 86%, 97%, and 100% of the time the 1st NP was chosen as the agent in the *ba*-construction by the three groups of Mandarin L2ers, respectively; 72%, 95%, and 96% of the time the 1st NP was chosen in the subjectless *ba*-construction by the three groups of Mandarin L2ers, respectively; and 56%, 68%, and 75% of the time the 1st NP was chosen as the agent by the three groups of Mandarin L2ers in the topicalization construction, respectively. The descriptive statistics in Table 1 clearly indicate that the intermediate and advanced E1M2ers do not perform differently on the N1 choices among these four types of constructions, and therefore, we collapsed the data of these two groups for further analysis. To investigate whether the rates at which they chose the first NPs differ across the four constructions across the three levels of proficiency with the latter two collapsed, a mixed three-way ANOVA was employed. The independent variables are the within-participants variable: the type of construction (SVO vs. *ba* vs. subjectless *ba* vs. OSV) and the between-participants variables: proficiency (elementary vs. intermediate and advanced) and List (1 vs. 2 vs. 3 vs. 4). The dependent variable is the proportion of the first NP choice. Since the participants were asked to make two choices on the same animation, their two choices were averaged as one value for the statistical analysis. If there existed a significant main effect of either List or type of construction, a Bonferroni post-hoc analysis would be applied.

The results indicated that there is a main effect of proficiency ($F_{(1,40)} =$

19.66, $p < .001$, $\eta^2 = .33$) and a main effect of construction type ($F_{(3, 40)} = 11.68$, $p < .001$, $\eta^2 = .23$). None of the following effects reach significance: the main effect of List and the two-way interaction effects between proficiency and type of construction, between proficiency and List, and between List and type of construction, and the three-way interaction effect among proficiency, type of construction, and List. Figure 1 displays the effects above.

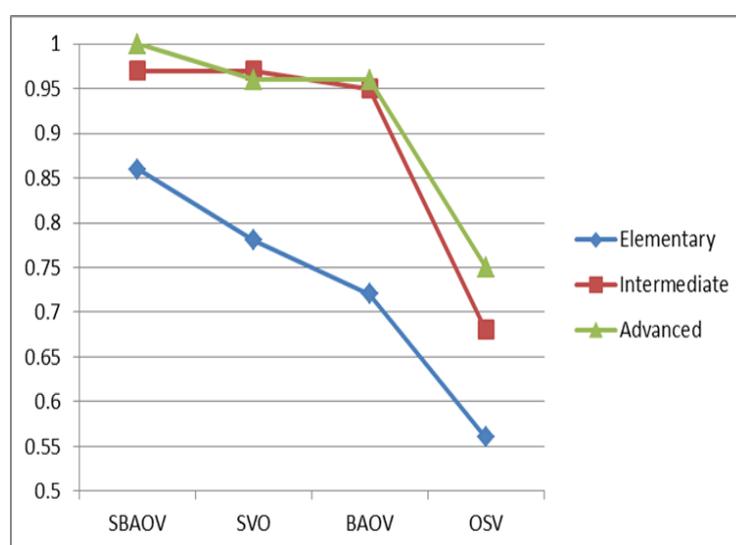


Figure 1 Native English speakers' N1 choices for the four constructions across three levels of proficiency

The post-hoc analysis of the main effect of the type of construction indicates that the number of the E1M2ers' N1 choices in the case of the OSV construction is significantly less than those for the remaining three types of constructions (OSV-SBAOV, $p < .001$; OSV-SVO, $p = .018 < .05$; OSV-BAOV, $p = .002 < .05$), whereas the differences in the three types of constructions among the *ba*-construction, the SVO construction, and the subjectless *ba*-construction does not reach significance (all $ps > .05$).

The results not only manifest how E1M2ers develop their syntactic representations and how they employ these representations to process the

four types of Mandarin transitive constructions along with their acquisition of Mandarin when the animacy cue is neutralized, but also clearly exhibit how the universal NVN strategy, L2 input, and their L1 influence their comprehension and acquisition. Figure 1 indicates a clear application of a strong NVN strategy by the E1M2ers in their comprehension of the constructions when the context is undecided because the verbs are pseudo ones. Even more, their comprehension of the OSV/NNV construction strengthens this use because native English speakers are well-known as users of N2 in the interpretation of the NNV and VNN constructions in their native language, i.e., they tend to choose the second NP as the agent in these two constructions (Bates & MacWhinney, 1989; Liu et al., 1992; Su, 2001a). Their performance **in** the comprehension of these four types of Mandarin transitive constructions indicates their use of a good-enough representation for grammatical processing, regardless of the validities of the cues, and they achieve a native-like performance when they reach a level of intermediate proficiency and above. Mandarin L2 input seems to strengthen their applications of the NVN strategy along with L2 acquisition as the descriptive statistics, which do not show a significant interaction effect, suggest.

5. EXPERIMENT 3: NATIVE SPEAKERS OF JAPANESE

Japanese is an SOV language that uses case marker to identify the agent-patient relationship regardless of the cue of word order (Bates & MacWhinney, 1989; Harrington, 1987; Sasaki, 1991; 1994). Sasaki (1994) investigated case sensitivity in processing English sentences like “he/she verbed him/her” and “him/her verbed he/she” among English L1 Japanese L2ers, Japanese L1 English L2 beginners and intermediate learners and found that Japanese L1 English L2 beginners are most sensitive to the case information of all **of** the three groups. They tend to choose the agent on the basis of case information more than the other two groups, indicating a clear L1 transfer from Japanese when they are processing English utterances. This tendency is somewhat weakened when their levels of English increase as seen in relation to the performance of their

intermediate counterparts. On the other hand, researchers (Harrington, 1987; Sasaki, 1991; 1994) also reported that when there is no case information available to identify the agent-patient relationship, i.e., in a construction with a pure transitive string, which does not exist in Japanese like NVN or NNV, Japanese L1 English L2ers tended to use the NVN strategy to interpret the sentences. They treated the first N in the NVN and NNV as the agent at a rate ranging from 60% to 90% depending on the material and their levels of proficiency in English. On the basis of Sasaki's (1994) results, we can predict that when they are processing the Mandarin *ba*-construction and subjectless *ba*-construction, they will pay particular attention to the salience of the object case marker *ba*. When the *ba*-marker is not available in a transitive construction, such as the NVN and NNV, they will use the NVN strategy to comprehend the sentences. As a result, their attention to the salient case-marker *ba* and NVN preferences makes them ignore the validities of the cues of these four types of transitive constructions at their initial stage of the acquisition of Mandarin. Once this form-function mapping is solidified due to L2 input, they may maintain these comprehension strategies in processing the four Mandarin transitive constructions.

5.1 Method

Participants. Sixty-eight Japanese native adults (range = 20-45, Mean age = 29, SD = 4.56, 34 men and 34 women) participated in a language comprehension task using a forced choice pointing paradigm (FCPP). The same criteria used for the English L2ers were applied for the assignments of the Japanese L2ers into levels of proficiency. There were 20 participants each for the elementary and intermediate levels of proficiency. There were 28 participants for the advanced level of Mandarin proficiency. All of the participants were speakers who had first started to learn Mandarin Chinese after the age of eighteen and who had had no early exposure to Mandarin Chinese before they started learning it. They were recruited at two national universities, but primarily came from a Mandarin Training Center in one of the two national universities in Taipei, Taiwan. All of the participants were tested in sound-dampened locations in either labs or classrooms at the two national universities. After the experiment,

these participants were each paid NT\$300.

5.2 Materials, Design, Counterbalancing, and Procedure

These were identical to those in Experiment 1: native Mandarin Chinese speakers, except that their accuracy rate of screening tests on the animal character identification phase was 88 percent, slightly lower than the native speakers' identification.

The materials, design, counterbalancing, and procedure in Experiment 3: were identical to those in Experiment 1: Native Mandarin Chinese speakers, except that the accuracy rate of their responses in the screening tests for the animal character identification phase was 88 percent, slightly lower than the accuracy rate of the native speakers of Mandarin for identification.

5.3 Analyses

The ways to analyze and code the data were identical to Experiment 1). Inter-rater reliability was 100%.

5.4 Results and Discussion

The column titled Japanese in Table 1 displays the proportion of native speakers of Japanese who chose the first NP as the agent for the four types of transitive constructions: the SVO construction, the *ba*-construction (SBAOV), the subjectless *ba*-construction (BAOV), and the topicalization construction (OSV) with the pseudo verbs when the animacy on both NPs is neutralized. It indicates that these participants chose the first NP in the four types of transitive constructions in the three levels of proficiency differently, particularly in the case of the elementary Mandarin L2ers, among the levels of elementary, intermediate, and advanced. 71%, 98%, and 94% of the time the 1st NP was chosen as the agent in the SVO construction by the elementary, intermediate, and advanced J1M2ers, respectively; 86%, 95%, and 100% of the time the 1st NP was chosen as the agent in the *ba*-construction by the three groups of Mandarin L2ers, respectively; 67%, 98%, and 100% of the time the 1st

NP was chosen in the subjectless *ba*-construction by the three groups of Mandarin L2ers, respectively; and 76%, 79%, and 94% of the time the 1st NP was chosen as the agent by the three groups of Mandarin L2ers in the topicalization construction, respectively. To investigate whether the rates at which they chose the first NPs differ in the case of each of these constructions across the three levels of proficiency, a mixed three-way ANOVA was employed. The independent variables are the within-participants variable: the type of construction (SVO vs. *ba* vs. subjectless *ba* vs. OSV) and the between-participants variables: proficiency (elementary vs. intermediate vs. advanced) and List (1 vs. 2 vs. 3 vs. 4). The dependent variable is the proportion of the first NP choice. Since the participants were asked to make two choices in the case of the same animation, their two choices were averaged as one value for the statistical analysis. If there existed a significant main effect of any of list, type of construction, or level of proficiency, a Bonferroni post-hoc analysis would be applied.

The results indicated that there is a main effect of proficiency ($F_{(2,56)} = 19.19, p < .001, \eta^2 = .41$) and a main effect of type of construction ($F_{(3,56)} = 4.05, p = .011 < .05, \eta^2 = .18$). None of the following effects reach significance: the main effect of List and the two-way interaction effects between proficiency and type of construction, between proficiency and List, and between List and type of construction, and the three-way interaction effect among proficiency, type of construction, and List. Figure 2 displays the effects that were specified above.

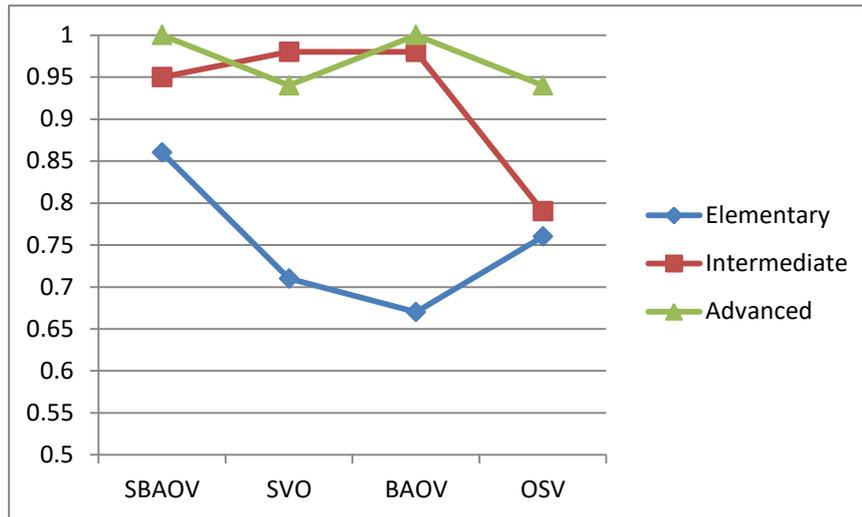


Figure 2 Native Japanese speakers' N1 choices on the four constructions across three levels of proficiency

The post-hoc analysis of the main effect of type of construction indicates that the number of J1M2ers' N1 choices for the OSV construction is significantly less than for the *ba*-construction (OSV-SBAOV, $p = .025 < .05$), whereas the differences among the *ba*-construction, the SVO construction, and the subjectless *ba*-construction and among the SVO construction, the subjectless *ba*-construction, and the OSV construction do not reach significance ($ps. > .05$). The post-hoc analysis of the main effect of proficiency indicates that the number of these participants' N1 choices in the advanced and intermediate levels is significantly more than the elementary level (advanced-elementary, $p = < .001$; intermediate- elementary, $p = < .001$), whereas there is no difference in their number of the N1 choices (both $ps > .05$).

The analysis above clearly shows that the Japanese speakers pay attention to the case marker and use the NVN strategy to comprehend the four constructions. Their comprehension is not affected by the relative frequencies of these constructions. In addition, their grammatical processing is also significantly affected by L1 transfer and by the L2 input

that they are exposed to. Although they use the NVN strategy to process these constructions, a mediated grammatical processing among L1 transfer, NVN strategy, and L2 input can be observed in their comprehension of the NNV/OSV construction. SOV word order is predominant in Japanese, which treats the first N as the agent and the second N as the patient. Elementary J1M2ers transfer this bias when encountering the Mandarin NNV construction with a caution that the Mandarin NNV construction is not completely interpreted as an SOV construction. This caveat persists in their intermediate level of language acquisition. However, L2 input strengthens this usage. Harrington (1987, cited in Kuno, 1973) reported that Japanese, unlike English, needs an entity to be an agent that is more animate than the patient. With longer exposure to Mandarin, Mandarin L2ers may detect a situation when Mandarin as well as Japanese needs an animacy contrast for the NNV construction. If no animacy contrast exists, the first N should be treated as the agent with confidence, leading to their N1 choices being identical in the case of the remaining three types of constructions at the advanced level. By contrast, these J1M2ers, regardless of proficiency, solidify the agent function to the pre-*ba* NP in the *ba*-construction where the NVN strategy and their particular attention to the object marker *ba* work in coalition to identify this function. Their performance on the N1 choices remains stable across proficiency levels as opposed to their fluctuation in the case of the OSV construction, leading to the difference between their comprehension and acquisition of these two types of transitive constructions.

6. GENERAL DISCUSSION

The previous three sets of experiments suggest that although Mandarin, English, and Japanese are three typologically different languages, native speakers of these languages all use an NVN strategy to comprehend the four types of transitive constructions with pseudo verbs when animacy cues are neutralized. Nevertheless, the figures in Table 1 and Figures 1 and 2 suggest that there may exist differences in grammatical processing among speakers from these three languages. To

investigate this point, a mixed two-way ANOVA was applied to compare and contrast the N1 choices of these three languages in the case of these four types of transitive constructions. The independent variables are level of proficiency with reference to six different levels, i.e., one level for native Mandarin Chinese, two levels for English elementary and intermediate and advanced as above, and three levels for Japanese and construction with four levels (SVO construction vs. *ba*-construction vs. subjectless *ba*-construction vs. OSV construction). The dependent variable is the proportion of the number of choices of the first NP by each participant.

The results indicate a main effect of proficiency ($F_{(5,138)} = 16.40$, $p < .001$, $\eta^2 = .37$) and a main effect of construction ($F_{(3,138)} = 19.75$, $p < .001$, $\eta^2 = .13$) and an interaction of proficiency and construction ($F_{(15,138)} = 1.85$, $p = .027 < .05$, $\eta^2 = .063$). The post-hoc analysis of the main effect of the type of construction indicates that the N1 choices of speakers of these three languages for the OSV construction is significantly less than in the case of the remaining three constructions (OSV-SBAOV, $p < .01$; OSV-SVO, $p < .01$; OSV-subjectless *ba*-construction, $p = .002 < .05$), and that their N1 choices in the case of the *ba*-construction are greater in number than those on the subjectless *ba*-construction (SBAOV-BAOV, $p = .01 < .05$), whereas the differences among the N1 choices of the *ba*-construction and the SVO construction do not reach significance ($ps > .05$). The post-hoc analysis of the main effect of proficiency indicates that the N1 choices of the participants in the advanced and intermediate levels of proficiency in Japanese and English and in native Mandarin Chinese are significantly more than those of the elementary level in native speakers of English (native Mandarin-elementary Mandarin, $p < .001$; advanced Mandarin-elementary Mandarin, $p < .001$; intermediate-elementary, $p < .001$) and those of the native speakers of Japanese (native Mandarin-elementary Mandarin, $p < .001$; advanced Mandarin-elementary Mandarin, $p < .001$; intermediate Mandarin-elementary Mandarin, $p < .001$), whereas there is no differences in NI choices among native Mandarin participants or among native speakers of English and Japanese in the intermediate and advanced Mandarin levels (all $ps > .05$).

The combined analysis above not only strengthens the conclusion that the Mandarin L2ers in this study employ an NVN strategy to comprehend the four types of transitive constructions, but also indicates an impact of L1 transfer and a facilitation of the use of a number of cues to identify the linking between form and function in the acquisition of Mandarin as an L2. One of the major questions in language acquisition is the linking problem, i.e., how the agent is linked to subject and how the patient is linked to object (Pinker, 1989; MacWhinney, 1987). This also serves as a major problem for the L2 acquisition at the initial stage in concerning how the existent linguistic functions of learners become linked to an unknown L2 construction. Adult L2ers are well-equipped with linguistic functions when they begin to acquire their second language, but they quickly face a problem, i.e., how their existent understanding of a function maps to the new constructions. Such mapping is full of indeterminacies for learners, particularly when the verbs may also be unknown to them. A lifesaver for learners may lie in a redundancy of cues. While there is only one cue for them to use to identify the agent function in the subjectless *ba*-construction, there are two cues in the *ba*-constructions to help them identify the agent function, facilitating their comprehension of this construction better than at the initial stage. On the other hand, when they collect sufficient exemplars for the one cue to identify the agent such as in the subjectless *ba*-construction in Mandarin, one cue is sufficient and two cues are redundant as reflected in their later acquisition of these three types of constructions. As a result, English and Japanese Mandarin L2ers exhibit a less optimal performance in their initial comprehension of the subjectless *ba*-construction, but soon catch up with their native counterparts. Although there is only one cue, word order cue, to support L2ers' comprehension of the SVO construction, their preferences to use the NVN strategy and the SVO construction, as the predominant and canonical structure in input, help them to acquire this construction even at the initial stage of the acquisition of Mandarin.

A comparison between English and Japanese speakers' comprehension of the Mandarin NNV construction further indicates how their L1 backgrounds and L2 input may exert an impact on their comprehension of this construction in addition to their NVN preferences. English speakers overall make significantly fewer N1 choices than

Japanese speakers. L1 transfer may be a primary cause, which is mediated by Mandarin L2 input. As mentioned earlier, English speakers tend to choose N2 as the agent in the NNV construction, and, therefore, when they are first acquiring Mandarin, they tend to be conservative in employing the NVN strategy to treat the first N as agent in comprehending this construction (Bates & MacWhinney, 1989). By contrast, NNV is a canonical word order in Japanese though its occurrence in Japanese needs to be licensed by case. Sasaki (1994) has reported that Japanese native speakers and elementary Japanese L1 English L2ers tend to treat the first N as the agent in Japanese when the animacy cue is neutralized. The performance of Japanese speakers incorporates this L1 transfer at their initial stage of Mandarin acquisition. Later in acquisition, both English and Japanese speakers learn that animacy is a vital cue that co-occurs with the NNV construction for them to comprehend these constructions as native speakers do (Li et al., 1993; Liu et al., 1992). When the animacy contrast is not present, their comprehension falls back to their preferences for the NVN strategy, ignoring the structural information that NNV carries in Mandarin Chinese. As a result, the number of their N1 choices increase accordingly.

Clahsen and Felser (2006) claimed that L2ers can only employ shallow structure representation, i.e., they will primarily rely on lexical, semantic, and pragmatic cues rather than on syntactic cues in grammatical processing, whereas native speakers can consider a full range of these linguistic cues in grammatical processing. If L2ers do not have such non-syntactic cues to rely on in L2 grammatical processing, their behavior will never be native-like, but, at most, chance-like, regardless of their L1 background or level of proficiency. The comprehension of the four types of Mandarin transitive constructions with pseudo verbs when the semantic cue, namely animacy, is neutralized of English L1 and J1M2ers provides evidence to clearly argue against this claim. First, when these Mandarin L2ers are processing the transitive constructions, they do not have lexical, semantic or pragmatic cues to rely on, but rely only on the syntactic cue, the NVN strategy, for their grammatical processing. In other words, they have no problem constructing their L2 grammatical representations in terms of syntactic or structural vocabulary. Second, not only can they employ a syntactically-based representation for grammatical processing,

but also their use of this representation leads them to comprehend these transitive constructions as native Mandarin speakers do, regardless of their typologically different L1 backgrounds.

This is the good-enough representation for the grammatical processing that native speakers and L2ers commonly use in their grammatical processing both L1 and L2 acquisition and which the Competition Model or Shallow Structure Representation have difficulty in capturing. Ferreira's Good-enough Representation accounts for language users' comprehension and captures the essence of the grammatical processing of these Mandarin native speakers' and of English L1 and J1M2ers in the following ways. First, comprehenders tend to use a syntactically-based NVN strategy that treats the first NP as agent and the second NP as patient when possible, regardless of the respective frequencies of the syntactic constructions. Thus, although these four types of Mandarin transitive constructions have their own frequencies of construction, these three groups of speakers treat them alike in the case of the SVO construction, the *ba*-construction, and the subjectless *ba*-construction, and, even for Mandarin L2ers' at the initial stage of the acquisition of Mandarin, at least in a similar pattern for comprehension. Second, such an application of the NVN strategy may cause problems of misinterpretation when the construction to be comprehended is non-canonical, i.e., its interpretation is not compatible with the use of an NVN strategy. Other factors may come into play. Therefore, L1 transfer, animacy, and L2 input mediate comprehension of this non-canonical NNV construction as reflected in the differences in comprehension among these three groups of speakers.

Nevertheless, it can also be argued that the conflicting reliabilities empowered by the Competition Model provide a similar prediction for the results as those above which will be elaborated in terms of the Competition Model below.¹ As mentioned, the Competition Model will predict that Mandarin speakers, including L2ers, will comprehend the use of the SVO construction better than the *ba*-construction and the subjectless *ba*-construction in terms of cue validities on the one hand, but, on the other hand, it will also predict that these speakers will comprehend the *ba*-construction better than the SVO construction in terms of the

¹ I need to express my gratitude to one of the reviewers who raised this interesting but crucial point in regard to my discussion and interpretation.

number of cues. In considering the conflicting reliabilities, the conjunction of these predictions leads to the inference that Mandarin speakers can comprehend the SVO construction and the *ba*-construction equally well. In addition, the employment of the emerging strengths in L2 cue validities and reliabilities across these four types of transitive constructions can also explain the strategies used in the comprehension of these constructions. Since the cue validity of the OSV construction in Mandarin is so low, Mandarin L2ers' comprehension tends to be subject to their L1 strategies. In other words, they tend to interpret this NNV construction on the basis of their L1 strategies. J1M2ers interpret it as an SOV construction. At first glance, E1M2ers should interpret it as an OSV construction on the basis of their L1, but their interpretation may be influenced by the significant number of 1st NP agent frequencies in their Mandarin L2, leading to their 75% SOV interpretation.

After consideration of the possible accounts derived from the Good-enough representation and Competition Model, I adopt Occam's Razor to argue that the former account has greater power than the latter. Occam's Razor states that when two or more models can account for the same sets of results in question, the one with fewer assumptions wins out. The Good-enough Representation account explains the results using the syntactic representation that is independent of input frequencies, while the Competition Model uses both syntactic representations and input frequencies for the explanation. As we have seen, the Competition Model also needs certain combinations of the assumptions, such as the conflicting reliabilities, to explain the results as equally well as the Good-enough Representation. I therefore opt for the Good-enough representation instead of Competition Model in seeking to explain the results found in this study.

7. CONCLUSION

Adult L2 acquisition often begins with a set of existent semantic functions and communicative intentions with attempts to search for or map to L2 syntactic constructions that are compatible with these lexical, semantic, or pragmatic notions. Since every L2er is equipped with various

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functional intentions to be implemented in L2 grammatical or syntactic acquisition, the state of competence for every L2er is therefore varied and substantially lexically, semantically, or pragmatically based. The current study attempts to investigate whether there is a cross-linguistic common representation of syntax, which is even common across the first and second language division in grammatical processing. Evidence from the comprehension of three groups of speakers of the four types of Mandarin transitive constructions with respective frequencies with pseudo verbs when animacy is neutralized argues that these speakers employ a good-enough representation of syntax, i.e., that they use the NVN strategy to comprehend these four constructions. When the constructions are not compatible with the use of the NVN strategy, L2ers' L1 backgrounds and L2 input come into play to mediate their grammatical processing. Their employment of good-enough representations of syntax in grammatical processing is cross-linguistically similar and common in both first language and second language.

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第二語言使用者運用夠用就好的表徵進行語句處理

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本文旨在探究第二語言使用者在進行語句處理時，他們的母語背景、外語熟練度以及普世共享的處理模式如何影響他們的語句處理。本研究探究了漢語母語、以及兩種語言類型迥然相異的英語以及日語母語者使用漢語作為第二語言的使用者在進行四種頻率不盡相同的漢語及物句：主動賓句、把字句、無主詞的把字句以及主題句，而且這些及物句配對著假動詞以及句式中的名詞均具有生命性時，上述的三種主要因素如何影響他們進行語句處理。研究結果發現，所有的漢語使用者均運用夠用就好的表徵，也就是將第一個名詞當成施事、第二個名詞當成受事的表徵進行處理。夠用就好表徵的運用造成了漢語使用者在理解前三種漢語及物句時有類似的表現，然而，漢語使用者的母語以及第二語言使用者所具有不同的漢語的熟練度對於他們處理不符合這種表徵的主題句時，造成了語句處理上的表現有所不同。

關鍵字：漢語、語句理解、英語、日語、句法