Acquisition of English Verb Transitivity by Native Speakers of Japanese

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1. Introduction

This study concerns the acquisition of the causative alternation of English verbs (e.g., *Tony broke the window* ↔ *The window broke*) by native speakers of Japanese. First, I will present a short survey of the causative alternation in English and Japanese. The survey shows that morphological marking for transitivity is arbitrary in both languages but in different ways; English lacks causative morphological markers (*labile*) whereas Japanese employs both causative and anticausative morphemes (*equipollent*) (Nedjalkov, 1969; Haspelmath, 1993). From a semantic perspective, the causative alternation in English is constrained by certain semantic principles (Levin, 1993; Pinker, 1989), such that *change-of-state* and *manner-of-motion* verbs typically participate in the causative alternation, but verbs of *disappearance* and *inherently-directed motion* do not. In Japanese, however, the constraints on the latter two verb classes do not exist. This difference results in a subset-superset relationship in lexical causativity between English and Japanese, which earlier studies on L2 argument structure alternation suggest to be a problem for the L2 learners (Bley-Vroman & Yoshinaga, 1992; Inagaki, 1997, 2001; Hirakawa & Suzuki, 2010; Montrul, 2001a). The subset-superset relationship, which I call the *asymmetric relationship in SLA* in this paper, predicts learnability difficulty when the usage of a certain grammatical construction in the learner's first language constitutes a superset of the usage in the target language (but not when it constitutes a subset). One of the goals of this paper is to investigate this hypothesis in the acquisition of the causative alternation in English by Japanese speakers. In addition, recent studies in the L1 acquisition of the causative construction (Ambridge et al., 2008) argue that frequency influences the acquisition process of the argument alternation. A second goal is to test this claim about frequency effects. In a computer-based experiment, 26 native English speakers and 35 Japanese native speakers learning English were tested with a grammaticality judgment task on English causative/intransitive sentences. The results largely support the predictions made by the asymmetric relationship but also suggest the influence of external factors such as frequency.

2. Causative alternation in English and Japanese

2.1. Causative alternation in English

One major research focus in the causative alternation in English is to determine exactly what semantic properties can license a verb to be in the causative alternation. This line of research is based on Levin (1993) who argues that verbs that participate in the same syntactic alternation share some semantic property. In other words, verbs that undergo the same syntactic alternation share the same semantic properties, possibly some sort of semantic basic element (Gropen et al., 1989, 1991; Pinker, 1989). As for the causative alternation, *change-of-state* (e.g., *break, burn, explode, improve, melt, open, split* etc.) and *change-of-position*, especially its subclass *manner-of-motion* (e.g., *bounce, drift, float, roll, shuffle* etc.), are the two major semantic classes that license causative-alternation verbs (Levin, 1993; Pinker, 1989). As shown ((1)-(2)), verbs in these two verb classes readily participate in the causative alternation.

(1) a. The egg boiled.
b. Rick boiled the egg.

(2) a. The ball bounced.
b. Rick bounced the ball.

(3) Verbs that participate in the causative alternation (Pinker, 2007)
bounce, dangle, drift, drop, float, glide, hang, lean, move, perch, rest, revolve, rock, roll, rotate, sit, skid, slide, spin, stand, swing, turn, twist, whirl, wind, age, bend, blur, break, burn, char, chill, collapse, condense, contract, corrode, crack, crash, crease, crinkle, crumble, crush, decrease, deflate, defrost, degrade, diminish, dissolve, distend, divide, double, drain, enlarge, expand, explode, fade, fill, flood, fold, fracture, fray, freeze, fuse, grow, halt, heal, heat, ignite, improve, increase, inflate, light, melt, multiply, pop, reproduce, rip, rumble, rupture, scorch, shatter, shrink, shrivel, single, sink, smash, swap, soak, splay, splinter, split, sprout, steep, stretch, tear, thaw, tilt, topple, warp, wrinkle

However, it is subject to debate exactly what semantic element in those two verb semantic classes is crucial for the causative alternation. The difficulty arises from the fact that certain subsets of the change-of-state and the change-of-position verbs do not participate in the alternation. One such class is *verbs of appearance and disappearance* (e.g., *appear, die, disappear, eliminate, expire, kill, perish, vanish* etc.). Verbs of appearance and disappearance are semantically members of the change-of-state verbs, but are systematically rejected in the causative construction (see (4)-(5)).

(4) a. A dove disappeared.
b. *The magician disappeared a dove.

(5) a. The patient died.
b. *The doctor died the patient.

Similarly, inherently-directed motion verbs (e.g., *go*, *come*, *arrive*, and *descend*; see (6)-(7)) show a strong contrast with manner-of-motion verbs (e.g., *bounce*, *march*, *run*). Both inherently-directed motion verbs and manner-of-motion verbs denote a change-of-position event, but unlike the manner-of-motion verbs the inherently-directed motion verbs systematically fail to participate in the causative alternation in English.

(6) a. The airplane descended.
b. *The pilot descended the airplane.

(7) a. My son came home today.
b. *Terry came my son home today.

In sum, the causative verbs in English are constrained by two main semantic properties; that is, change-of-state and change-of-position. However, verbs of disappearance and inherently-directed motion verbs, two subgroups of the causative semantic verb class, are not allowed in causative constructions.

2.2. Lexical causativity in Japanese

A challenge in investigating the L2 acquisition of causativity is that each language employs different means to indicate different levels of causativity. For example, causativity can be discussed from a structural view, ranging from the productive peripheral causative to the unpredictable lexical causative (Shibatani, 1976), and from a semantic view, such as direct causative, indirect causative, and sociative/associative causative (Shibatani, 2004). Although the scope of this paper is limited to the acquisition of lexical causatiivity, the distinction between the syntactic causative and the lexical causative in Japanese is worth brief discussion since it is a major issue in the causativity in Japanese (Miyagawa, 1998; Harley, 2008; Miyagawa, 1998, 2002; Shibatani, 1976, 2004).

In Japanese, the productive causative sentence, a structure equivalent to English *make/let/have the window break*, is marked with the causative morpheme *-sase* or its allomorphe *-ase* as shown in (8). The lexical causative, on the other hand, is marked with irregular morphemes (see (9)).

(8) Syntactic causative with causative morpheme *-(s)ase*

a. Shota-ga Yuji-ni hon-o yom-ase-ta
Shota-NOM Yuji-DAT book-ACC read-CAUSE-PAST
Shota made/let/have Yuji read a book.

b. Gichou-wa gikai-o hirak-ase-ta.
chairman-TOP cabinet-ACC open-CAUSE-PAST
Chairman made/let/have the cabinet open.

c. Shota-wa otouto-ni otsukai-ni ik-ase-ta
Shota-TOP brother-DAT errand-TO go-CAUSE-PAST
Shota made/let/had his brother go the errand.

(9) Lexical causative

a. Shota-ga mado-o kowashita. / Mado-ga kowareta
Shota-NOM window-ACC break$_{trans}$ / window-NOM break$_{intra}$
Shota broke the window. / The window broke.

b. Shota-ga tegami-o yaita. / Tegami-ga yaketa.
Shota-NOM letter-ACC burn$_{trans}$ / letter-NOM burn$_{intra}$
Shota burned the letter. / The letter burned.

c. Shota-ga tsukue-o yurashita. / Tsukue-ga yureta.
Shota-NOM desk-ACC shake$_{trans}$ / desk-NOM shake$_{intra}$
Shota shook his desk. / The desk shook.

According to Haspelmath (1993), the majority of lexical causatives in Japanese are *equipollent*, meaning that both transitive and intransitive members of the lexical causative pair are derived from the same stem. Unlike the unmarked *labile* causative pair in English, one or both members of the equipollent causative pair in Japanese are morphologically marked. Equipollent is a non-directed causative pattern since the morphological marking takes place in an inconsistent manner and cannot be classified as either causative or anticausative. The example below illustrates how the morphological marker *-e-* is employed as a causative marker in one pair and as an anticausative marker in another pair. In other words, *-e-* can mark either the causative (transitive) member or the inchoative (intransitive) member in Japanese (Jacobsen, 1992).

(10) Lexical causative marker in Japanese

a. i. John-ga mado-o ak-e-ta.
John-NOM window-ACC open$_{trans}$
John opened the window.

ii. Mado-ga aita.
window-NOM open$_{intra}$
The window opened.

b. i. John-ga tegami-o yaita.
John-NOM letter-ACC burn$_{trans}$
John burnt the letter.

ii. Tegami-ga yak-e-ta.
Letter-NOM burnt$_{intra}$
The letter burnt.

Another characteristic of the Japanese lexical causative is the variability of the morphological markers. Jacobsen (1992) compiled a small corpus of Japanese lexical causative pairs and found that 16 different morphological patterns exist among 354 lexical causative pairs in Japanese. This complex morphological marking in Japanese makes it difficult to delineate between the syntactic causative and the lexical causative. In this paper, I adopt Jacobsen's (1992) classification of Japanese lexical causative since Jacobsen has the most comprehensive listing of lexical causative in Japanese to my knowledge.

Following Jacobsen's definition 1992, all causative pairs marked with any causative morpheme other than the regular causative morpheme *-sase-* and its allomorph *-ase-* are unpredictable and thus their causativity is lexically encoded.

2.3. Comparison of lexical causativity between English and Japanese

Like in English, Japanese lexical causative verbs also exhibit some semantic constraints, but there are some differences. In the previous section, I described how the lexical causative in English is constrained by the semantic class of the verb such that only "change-of-state" verbs and "manner-of-motion" verbs are allowed in the causative alternation, but their sub-classes "disappearance" and "inherently-directed motion" verbs are not. To make comparative analyses in Japanese, I classified Jacobsen's 354 lexical causative paris in terms of their semantic class. The classification (see Table 1) shows that, like the English lexical causative verbs, the majority of the lexical causative verbs in Japanese are classified as "change-of-state" or "manner-of-motion". In addition, some Japanese lexical causative verbs belong to "inherently-directed motion" (e.g., *agaru* "ascend", *oriru* "descend" etc.), and "verbs of appearing/disappearing" (e.g., *kieru* "disappear", *nakunaru* "pass away" etc.)[1].

Table 1: *Distribution of verb semantic classes in the 354 Japanese transitive/intransitive pairs in Jacobsen (1992)*

VERB SEMANTIC CLASS	COUNT
change-of-state	126
manner-of-motion	44
stative	40
mental state	37
inherently-directed motion	36
change-of-location	28
verbs of appearing/disappearing	24
transaction	10
verbs that emit light sound, substance	5
touch verbs	1
verbs of laughing	1

For "inherently-directed motion" verbs, Tsujimura (Tsujimura, 2002, 2006) also found that the following verbs appear with (lexical) transitive pairs.

(11) directed motion verbs that have (lexical) transitive pairs (from Tsujimura (2002, 2006))
  a. *iku* 'go', *kuru* 'come', *tsuku* 'arrive', *kaeru* 'return', *noboru* 'climb up', *dekakeru* 'leave', *tobidasu* 'come out suddenly', *agaru* 'ascend', *sagaru* 'descend', *noru* 'get on', *oriru* 'get off', *chikazuku* 'come closer', *toozakaru* 'go away'

In sum, unlike in English, neither the "verbs of disappearance" nor "inherently-directed motion verbs" are prohibited in the lexical causative in Japanese. The causative verbs in the two languages can be discussed on the same structural and semantic grounds, but, in terms of semantic restrictions, the Japanese lexical causative is not subject to the finer semantic constraints on the verbs of disappearance and the inherently-directed motion verbs.

3. Asymmetric relationship in SLA

The gap between the causative alternation in English and Japanese results in an asymmetric relationship, which has been discussed in several recent SLA studies. These studies found that, between

[1] 'stative' indicates one of the transitive members indicates a stative interpretation rather than an event. For example, *kakeru/kaku* "be in lack/lack", *fukumu/fukumeru* "be included/include", *tsuranaru/tsuraneru* "be lined up/line up" etc.

any two languages (say, English and Japanese), it is not necessarily true that learners of these two languages (English native speakers learning Japanese and Japanese native speakers learning English) will face difficulty in the same grammatical construction. This asymmetry is caused by the different types of feedback that the learner needs to rectify their interlanguage grammar. If the learner's L1 usage constitutes a subset of the L2, the L2 learners only need positive feedback to rectify their interlanguage grammar. On the other hand, if the learner's L1 usage is a superset of the L2, the L2 learners will need some form of negative feedback (Bley-Vroman & Yoshinaga, 1992; Inagaki, 1997, 2001; Hirakawa & Suzuki, 2010; Montrul, 2001a). This asymmetric learnability is found in various Japanese-English SLA studies, including studies on the indirect (adversely-affected) passive (Izumi & Lakshmanan, 1998), manner-of-motion verbs (Inagaki, 2001, 2002), dative alternation (Bley-Vroman & Yoshinaga, 1992; Inagaki, 1997), and causative morpheme (Montrul, 2001a,b).

For the current study, causative verbs in Japanese and English constitute an asymmetric relationship since the usage of the causative alternation in Japanese is wider than that of English. More specifically, as shown in Figure 1, transitive sentences with an inherently-directed motion verb or a verb of disappearance such as (12) and (13) are grammatical in Japanese, but not in English.

(12) a. *The man vanished the coin.
b. Otoko-ga koin-wo keshita (cf. koin-ga kieta)
man-NOM coin-ACC vanished$_{TRANS}$ (coin-NOM vanished$_{INTRA}$)
The man vanished the coin.

(13) a. *The man descended the airplane.
b. Otoko-ga hikoki-wo oroshita (cf. Hikoki-ga orita)
man-NOM airplane-ACC descended$_{TRANS}$ (airplane-NOM descended$_{INTRA}$)
The man descended the airplane.

Assuming that all relevant features in L1 will transfer to L2 and both L1 acquisition and L2 acquisition are governed by the same principles (cf. Full Transfer/Full Access hypothesis (Schwartz & Sprouse, 1996)), a learnability problem in rejecting these ungrammatical constructions is predicted since the native speakers of Japanese learning English need to receive some form of negative feedback to rectify their interlanguage grammar. The type of feedback required to acquire the other constructions in the causative alternation (e.g., *The coin vanished.*) is qualitatively different for two reasons; first, the L2 learner will receive positive feedback for those constructions in L2 and, second, the L1 grammar will not interfere with the acquisition of the equivalent constructions in L2.

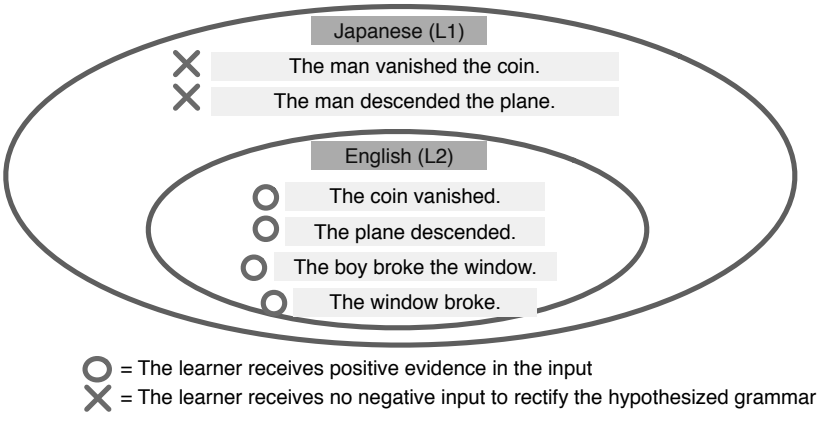

Figure 1: The asymmetric relationship of the causative verbs

4. Frequency effect

4.1. Frequency effects on first language acquisition

In this section, I briefly discuss the effect of frequency with reference to *Zipf's distribution*, a distribution known to characterize word frequency (Baayen, 2001, 2008a) and many other language phenomena.

A large body of literature suggests that there is an effect of frequency on L1 acquisition. Studies on the acquisition of verbs by young children show that early Age-of-Acquisition (AoA) words such as *come, hit, take* and *disappear* are more frequent than their semantically equivalent late-AoA words *arrive, strike, remove* and *vanish*. Research on the lexicon has attested to the frequency effect and suggests that the lexicon stores not only lexical features but also information related to frequency. In lexical decision experiments, high-frequency words are accessed faster than low-frequency words (Forster & Chambers, 1973) even after controlling for the length and phonological complexity of words. For example, among *clock*, *doctor*, *hut*, and *urn*, the first two high-frequency words are processed faster than the latter low-frequency words.

The role of frequency has also been attested in the acquisition of argument structure alternations. Brooks and her colleagues (Brooks et al., 1999) found that children use prototypical and high-frequency verbs in the correct argument structure. In their study, 3 to 5 year-old children generated high-frequency verbs in the correct construction (e.g., *Big Bird made the car disappear* / *The car disappeared*), and the low-frequency verbs were used frequently in the incorrect construction (e.g., **Big Bird vanished the car*). Similarly, Ambridge et al. (Ambridge et al., 2008) suggested an interactive role of frequency and verb semantic class in children's acquisition of the argument alternation. In their study, 5 to 10 years old children exhibited adult-like grammatical preference with prototypically intransitive verbs (e.g., *Homer fell / *The man fell Homer*), but such adult-like performance was not observed with low-frequency verbs (e.g., *Homer tumbled / *The man tumbled Homer*) and novel verbs that were introduced as synonymous with the prototypical intransitive verb (e.g., *Homer meeked / *The man meeked Homer*).

While it is obvious that frequency plays some role in language acquisition, especially in SLA, researchers disagree widely with the extent of its effects. One one hand, some researchers (Brooks & Tomasello, 1999a,b; Brooks, 2004; Ellis, 2002) argue that distributional information of frequency, along with domain-general cognitive skills such as memory and categorization is crucial for language acquisition. In consequence, they view innate grammatical knowledge for language acquisition as secondary or even nonexistent. Some others acknowledge the roles of both language internal and external factors and attempt to delineate the interface between biological base for language acquisition and frequency effects. Ambridge et al. (Ambridge et al., 2008) are such an example who claim that the (innate) semantic classes and frequency effects work interactively since neither factor alone can account for their existing evidence perfectly.

In the following section, I will present a short survey of language frequency in an attempt to further elucidate issues related to the frequency-based account for language acquisition.

4.2. Frequency effects and Zipf's law

The role of frequency in language acquisition must be considered in light of Zipf's law (Zipf, 1949), which states that the rank of a word, $r(w)$ (e.g., the most frequent word is assigned rank 1), and the frequency of a word, $f(w)$, are inversely proportional to a constant C (see (14)). Zipf's Power Law includes an exponential coefficient α that determines how quickly frequency decreases with rank, but it is often ignored since α depends on the type of linguistic distribution and should be calculated for each data set. Assuming α is 1, if the most frequent word ($r(w) = 1$) has a frequency of 60,000 ($f(w) = 60,000$), then the second most frequent word is expected to have a frequency of 30,000, and the frequency of the third most frequent word is expected to be 20,000.

(14) Zipf's power law (from Baayen 2001)

a. $f(w) = \dfrac{C}{r(w)^{\alpha}}$

where $f(w)$=frequency of the word, $r(w)$=rank of the word, C=constant

Zipf's law is an empirical observation of word distributions in language and patterns predicted by the Zipf's law have been found in various language data. There are two major characteristics of the Zipfian distribution. One concerns high-frequency types, whose frequency is high but the total number of types is small. The other property concerns the low-frequency types; whereas the number of high-frequency word types is highly limited, the low-frequency word types are abundant in the Zipfian distribution. The frequency of words decreases rapidly after a certain number of high-frequency words and, therefore, words that are ranked after the first few high-frequency words occur considerably less frequently. As a results, the majority of word types in the linguistic distribution occur only a few times or even only once.

In order to demonstrate these characteristics of Zipf's distribution, I extracted the frequency distribution from the adults' utterances (motherese) in the CHILDES corpus (MacWhinney, 2000). The sample consists of randomly selected 3,000 words in the adults' utterances to 2-year-old children. Since some words appeared more than twice, the number of word types (596 types) is smaller than the number of word tokens (3,000 tokens). The examination of the data reveals that the 10 most frequent words (i.e., *you*, *xx* (interjection), *the*, *it*, *is*, *I*, *a*, *that*, *to*, and *do*) account for 20% of the total frequency (608 occurrences out of 3,000). On the other hand, 254 types out of a total of 596 word types (i.e., 43% of the total vocabulary) appeared only once. The same pattern of the large number of low-frequency items repeatedly appeared in other age groups; 47% of the 3-year-old children's input and 39% for the 4-year-old children's input appeared only once in a given sample. Thus, as discussed above, a large number of low-frequency word types account for a significant proportion of the total word types of the input for L1 English children.

Although Zipf's law was originally proposed for the word frequency distribution (Baayen, 2001, 2008a), recent studies (Yang, 2008, 2010) have found that Zipfian-like distributions also exist for n-grams (Yang, 2010), phrase-structure rules in Penn TreeBank, and verb-object constructions in CHILDES (Yang, 2008, 2010). Thus, the pattern that low-frequency types account for a large proportion of a linguistic distribution is not unique to the word distribution, but is present in many other linguistic distributions, presumably also in the distributions of verbs within the verb semantic classes.

Zipf's law leaves us with a critical problem in frequency-based account for language acquisition. While language learners repeatedly encounter a small number of high-frequency items in their input, they rarely see a large number of low-frequency words, many of which occur only once or even never in their experience. To put it differently, high-frequency words are *extremely* high-frequency and the number of low-frequency words is *extremely* large. The usage-based account for language acquisition must be accountable for both high-frequency items and low-frequency items. In other words, in order to investigate the frequency effect on second language acquisition, it is crucial to investigate learners' behavior with low-frequency items.

For the current study, the crucial information can be obtained from the learners' acquisition process of low-frequency verbs (e.g., *crash* in the change-of-state verb class as opposed to *break*, and *tumble* in the inherently-directed motion verb class as opposed to *go*). While the total frequency of these low-frequency verbs is marginal and these low-frequency verbs rarely appear in the language input/output, native speakers of English usually have clear categorical judgment with these low-frequency items. From the frequency-based perspective, it is expected that L2 learners will fail to achieve native-like performance with low-frequency items since their exposure to low-frequency verbs may not be large enough. If the frequency effects are conditioned by language-specific factors such as verb semantic class, it is expected that L2 learners will make some categorical judgements even with low-frequency items like native speakers.

5. Research questions

The purpose of this study is to investigate the acquisition process of the causative alternation in L2 English by native speakers of Japanese. Three major influences that are known or have been argued to influence L2 acquisition are considered in this study; that is, the verb's semantic class, the asymmetric relationship between L1 and L2, and the frequency of the verb. Previous studies suggest that problems in L2 typically arise when the L1 grammar is a superset of the L2 grammar, and frequency effects have been proposed to factor into this process (Ambridge et al., 2008). This study investigates whether or not the same pattern emerges in the acquisition of the causative alternation in L2 English by native speakers

of Japanese. The research questions for the current study are as following:

(15) Research Questions

a. Where the verb semantic classes constitute a asymmetric relationship between English and Japanese (e.g., verbs of disappearance and inherently-directed motion verbs), can L2 learners acquire the usage of the construction that is a subset of their L1?

b. If so, what is the role of frequency in this acquisition process?

6. Method

6.1. Participants

Twenty-six native English-speaking participants (control group) and 35 Japanese-speaking participants (focus group) participated in the experiment. Participants were recruited on three different campuses of the City University of New York (CUNY Graduate Center, Queens College, and LaGuardia Community College). All participants for the focus group were native speakers of Japanese who used Japanese as their primary language of instruction at least until high school. All the participants in the focus group had been in the U.S. for at least half a year at the time of the experiment and they were all learning English as a second language.

The summary of the selected items of the questionnaire is listed in Table 2. The demographics of the control group were mixed in terms of ethnicity and the focus group had various degrees of formal instruction in English. The average length of stay in the U.S. among the control group participants is 2.8 with a standard deviation of 2.98. Both groups had a wide range of age and educational background. For example, although the majority of participants were in the range of 18-39 years old, the average age was slightly higher in the focus group. Education also varied from high school to the doctoral level with a slightly higher average in the focus group. However, since none of the demographics factors had statistically significant effects on the grammatical judgment score, the dependent variable in the current experiment, these demographic factors will not be considered further in the current study.

Table 2: *Summary of the questionnaire data*

GENDER	NATIVE	NON-NATIVE
Female	10	25
Male	16	10
	Fem: 38%	Fem: 71%

LENGTH OF STAY IN THE US	NATIVE	NON-NATIVE
0-1 year	-	9
1-2 years	-	4
2-3 years	-	6
3-4 years	-	0
4-5 years	-	4
more than 6 years	-	3
Mean (SD)	-	2.8 (2.98)

AGE	NATIVE	NON-NATIVE
under 20 yld	10	1
20-29 yld	10	14
30-39 yld	2	17
40-49 yld	1	2
50-59 yld	3	1
Mean (SD)	26.15 (13.06)	31.57 (7.65)

ETHNIC BACKGROUND	NATIVE	NON-NATIVE
African American	8	0
Asian	2	0
Hispanic/Latino	3	0
Japanese	0	35
Other	5	0
White	8	0

6.2. English Proficiency

The English proficiency of the focus group participants was tested using the listening section of The Michigan English Language Assessment Battery (MELAB) (Testing and Certification Division English Language Institute, 2009), and, self-evaluation of English proficiency in a questionnaire. The mean number of items correct on the MELAB was 35.51 out of 45 items with a standard deviation of 4.94 and a standard error of 0.84 (see Figure 2).

The MELAB score was moderately to strongly correlated with the duration of stay in the U.S., TOEFL scores, and the self-assessment of English proficiency (r between $.40$ and $.57$; all $p's = .01$), while some other questionnaire items (i.e., ESL classes, college-level classes, and *Eiken*[2]) were not.

[2] Test in Practical English Proficiency administered by the Ministry of Education in Japan

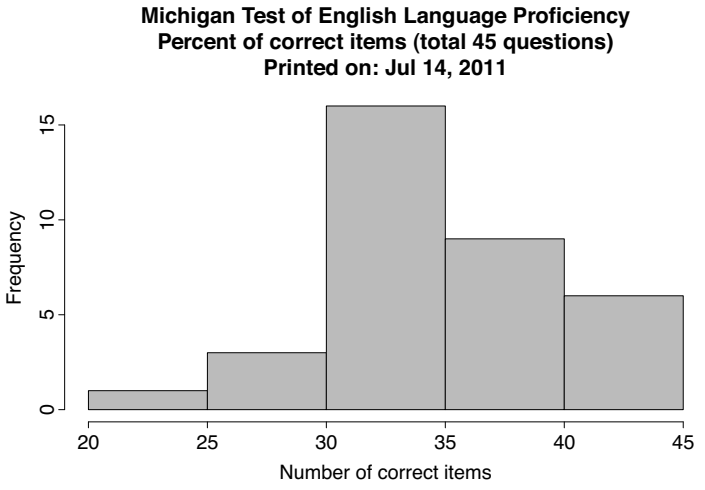

Figure 2: Histogram for the MELAB scores of the focus group (Japanese native speakers) participants

6.3. Stimuli

Four verb semantic classes were selected from Levin (1993) and Pinker (1989; 2007). They were then consolidated into two larger classes based on their theoretically-expected acceptability in causative constructions. They are Exceptional Causative Type, including the verbs of disappearance and the inherently-directed motion verb, and Prototypical Causative Type, including the change-of-state verb and the manner-of-motion verb (see Table 3).

Table 3: *Two verb semantic classes and verbs used in the experiment*

VERB TYPE	LEVIN (1993)/PINKER (1989)	STIMULUS VERBS		
		HIGH FREQ	MID FREQ	LOW FREQ
Exceptional causative	Verbs of **disappearance**	*die*	*disappear*	*vanish*
	Inherently-directed motion verbs	*go*	*descend*	*tumble*
Prototypical causative	**Change-of-state** verbs	*sink*	*melt*	*crash*
	Manner-of-motion verbs	*move*	*roll*	*bounce*

Each participant saw three verbs from different frequency strata for a given verb semantic class. For example, in the Exceptional Causative Type, *die* (high-frequency disappearance verb), *go* (high-frequency inherently-directed motion verb), *disappear* (mid-freq disappearance), *descend* (mid-freq inherently-directed motion), *vanish* (low-freq disappearance), and *tumble* (low-freq inherently-directed motion) were selected. Frequencies of the stimulus verbs were counted using the Open American National Corpus (OANC) (Reppen et al., 2005), the Penn Treebank Corpus (PTB) (Marcus et al., 1994), and CELEX2 (Baayen et al., 1996). The frequency counts in the three corpora are highly correlated in the range of 0.95 to 0.98. Because of the instability of the frequency counts for low-frequency types, verb frequency counted within each class was converted into ordinal categories (high, mid, and low) for some of the data analyses. When an analysis required interval variables, the logarithmically transformed raw verb frequency derived from CELEX2 was employed.

Table 4: *Comparisons of the frequency counts of the stimulus verbs in the three different corpora*

	VERBCLASS	WORD	PTB	OANC	CELEX2
1	Disappearance	die	84	4537	4279
2	Disappearance	disappear	25	762	1234
3	Disappearance	vanish	7	196	729
4	Inherently-directed motion	go	1026	54884	51830
5	Inherently-directed motion	descend	5	265	448
6	Inherently-directed motion	tumble	68	106	200
7	Change of state	sink	38	333	892
8	Change of state	melt	5	229	436
9	Change of state	crash	15	359	335
10	Manner of motion	move	331	6637	7653
11	Manner of motion	roll	51	840	1287
12	Manner of motion	bounce	25	291	289

In the experiment, each verb was used in three different frames: an agent intransitive frame (Agent Intransitive, hereafter; e.g., **The man vanished*, in the sense of the man made someone disappear), a theme intransitive frame (Theme Intransitive, hereafter; e.g., *The coin vanished*), and a transitive frame (Transitive, hereafter; **The man vanished the coin*) (see Figure 3). Each of these three sentences appeared upon the completion of a video clip, in which an animated agent and potential patient make various kinds of movement. Then, the participant was asked to rate its adequacy of the description of the video on a 5-point Likert scale (see Figure 4).

Figure 3: Frames from the movie clip for the stimulus verb *vanish* (*The man vanished the coin.*; *The man vanished.*; and *The coin vanished.*)

One-third of the stimuli were distractor sentences, which were either in correct descriptions of the movie (e.g., *The car hit the man.*), inaccurate descriptions of the movie (**The car honked at the man.*), or ungrammatical descriptions (**Hit the car man.*). There were 36 stimulus sentences (3 verbs $\times$ 4 semantic classes $\times$ 3 sentence frames). The experiment was self-paced and the stimuli were randomized for each participant.

6.4. Research design

All procedures were carried out at a computer station in a quiet room. The procedure consisted of three parts: (1) Questionnaire, (2) English proficiency assessment, and (3) Grammaticality judgment of English sentences with visual cues. It took about 45-50 minutes to complete the experiment module for the control-group (native English-speaker) participants and 60-70 minutes for the focus-group (native Japanese-speaker) participants. In the grammaticality judgment part of the experiment, each participant watched a video clip in which an animated agent and potential patient make various kinds of movement. Upon the completion of the video, the participant saw an English sentence and was asked to rate its adequacy of the description of the video on a 5-point Likert scale from 1 (least adequate sentence) to 5 (most adequate sentence).

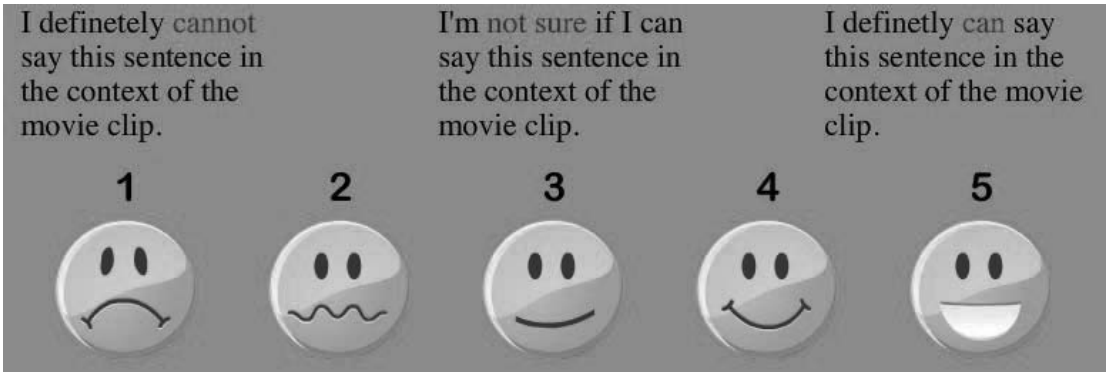

Figure 4: Grammaticality judgment scale with smiley face illustrations

6.5. Data analysis procedures

The design of the experiment is the repeated-measure design, in which the participants saw the verb, representing each level of the experimental factors. The traditional statistical analysis that is appropriate for this kind of research design is a mixed-design Analysis of Variance (ANOVA) with within-subject factors treated as a repeated measure. In this study, in addition to the mixed-design ANOVA, the data were analyzed with mixed-effect (linear) model. The mixed-effect model has major advantages over the repeated-measure approach since it is not constrained with such assumptions as the homogeneity of error variance, the independence of observations, and balanced data. The robustness against the missing data and outliers is a boon since experimental studies like this one are rarely perfectly balanced. Both analyses were conducted using $\mathcal{R}$ (R Development Core Team, 2008) with the $\mathcal{R}$ packages ez (Lawrence, 2011), lmer (Bates, 2008), languageR (Baayen, 2008b), and LMERConvenienceFunctions (Tremblay, 2012).

7. Data

7.1. Analyses with the mixed-design ANOVA

The mean grammaticality judgment scores (Grammatical Judgment, hereafter) by sentence frame (Frame, hereafter) and by Proficiency for the Exceptional Causative Type (i.e., inherently-directed motion and disappear verbs) and the Prototypical Causative Type (i.e., manner-of-motion and change-of-state verbs) are plotted in Figure 5.

In the Exceptional and Prototypical Causative Types, the expected judgment score for the Agent Intransitive Frame is 1 (least adequate sentence) because the sentence has an agentive entity as the subject (e.g., *The man disappeared* in a sense that the man made something disappear.). These sentences can be perceived as grammatical by the participants but must be rejected due to the mismatch between the sentence and the stimulus video clip (in the video clip, a man made the coin disappear). On the other hand, the expected judgment score for the Theme Intransitive Frame is 5 (most adequate). Finally, the native and non-native participants' responses in the Transitive Frame are the main interest in the current study. The expected judgment score for the Transitive Frame differs between the Prototypical Causative Type and the Exceptional Causative Type; the expected judgment score for Prototypical Causative Type is 5 (e.g., *The man broke the window*) whereas for Exceptional Causative Type it is 1 (e.g., **The man disappeared the coin*). To repeat, the verbs in the Exceptional Causative Type are acceptable in the L2 participants' native language (i.e., Japanese) and, therefore, it was predicted that native Japanese speakers learning English as L2 would face a problem in rejecting causative sentences with verbs of the Exceptional Causative Type.

A 2 (Verb Type: Prototypical, Exceptional) $\times$ 3 (Frequency: high, mid, low) $\times$ 3 (Frame: transitive, agent intransitive, theme intransitive) $\times$ 3 (Proficiency: native, high, low) four-way mixed-design ANOVA (DV: Grammatical Judgment) was conducted.

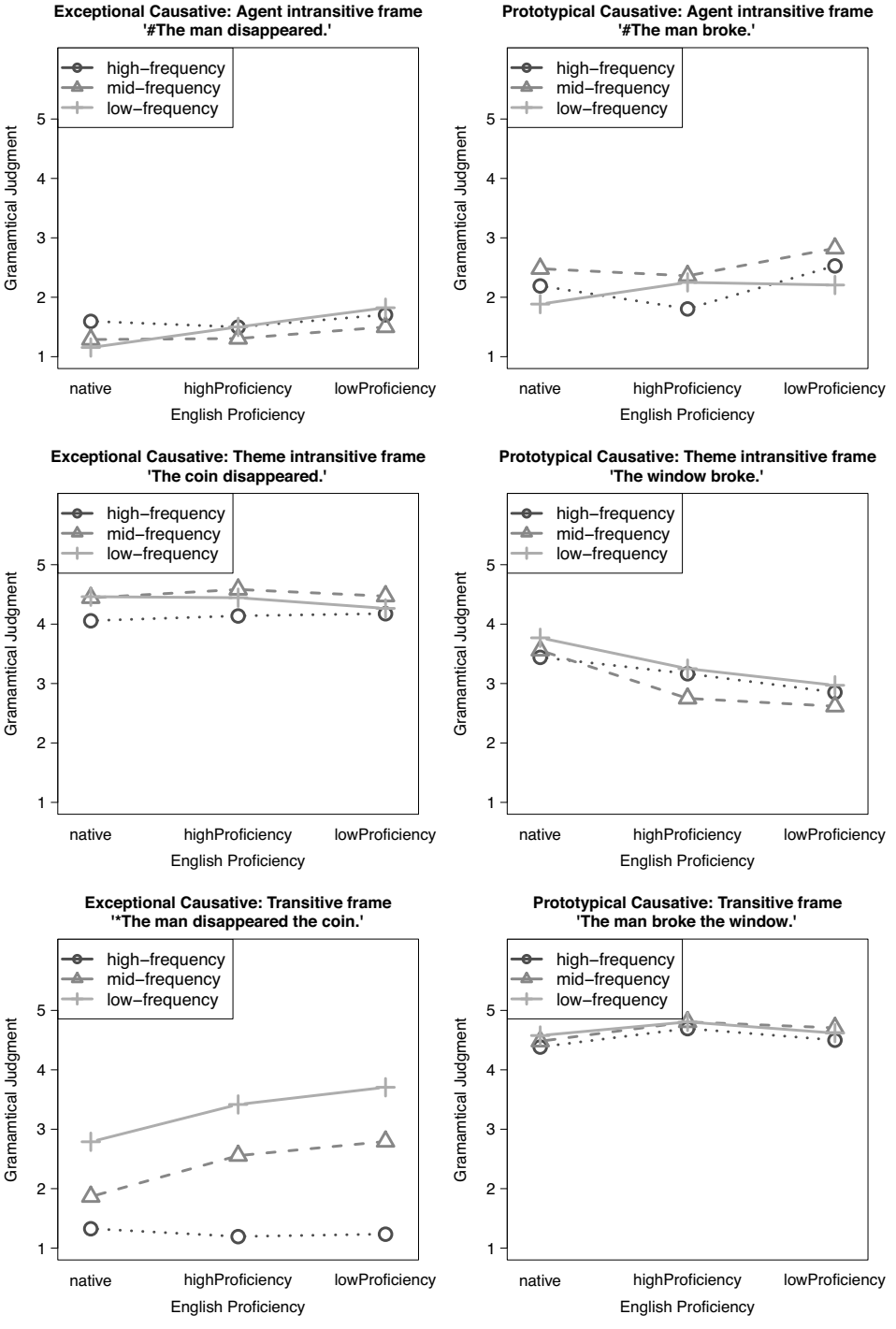

Figure 5: Plots for Grammatical Judgment scores for the Exceptional Causative Type and the Prototypical Causative Type

In this analysis, there were a main effect of Verb Type ($F(1, 58) = 194.39, p = .00$), significant two-way interactions between Verb Type×Frequency ($F(2, 116) = 24.93, p = .00$), Verb Type×Frame ($F(2, 116) = 328.74, p = .00$), and Verb Type×Proficiency ($F(2, 116) = 2.06, p = .04$), and a three-way interaction ($F(4, 232) = 31.90, p = .00$).

Follow-up 3 (Frequency) × 3 (Proficiency) two-way mixed-design ANOVAs were carried out for each sentence frame for each Verb Type, whose results are presented in Table 6 in Appendix. For

the Exceptional Causative Type, in the Agent Intransitive Frame (e.g., *The man disappeared* and *The man broke* etc.), there were significant main effects of Proficiency ($F(2, 58) = 4.10, p = .02$) and Frequency ($F(2, 116) = 5.27, p = .01$) and an interaction effect between them ($F(4, 116) = 3.00, p = .02$). For the Prototypical Causative Type, on the other hand, only the main effects of Frequency ($F(2, 116) = 6.75, p = .00$) was significant in the Agent Intransitive Frame. The range of the effect size for the significant differences is very small ($\eta^2 : 0.04 - 0.07$), indicating that the significant factors in the Agent Intransitive Frame account for only faction of the total variability of the data.

In the Theme Intransitive Frame (e.g, *The coin disappeared* and *The window broke* etc.), significant main effects of Frequency ($F(2, 116) = 11.51, p = .00$) in the Exceptional Causative Type, and Proficiency ($F(2, 58) = 4.14, p = .02$) and Frequency ($F(2, 116) = 3.15, p = .05$) in Prototypical Causative Type were found. In the Theme Intransitive Frame, neither interaction effect was significant. Similar to the Agent Intransitive Frame, the range of the effect size for the significant differences is very small ($\eta^2 : 0.02 - 0.10$).

Finally, in the Transitive Frame (e.g., **The man disappeared the coin* and *The man broke the window*), where the influence of L1 was predicted, while there are significant main effects of Proficiency (Exceptional: $F(2, 58) = 6.46, p = .00$; Prototypical: $F(2, 58) = 3.89, p = .03$) and Frequency (Exceptional: $F(4, 116) = 102.17, p = .00$; Prototypical: $F(4, 116) = 3.56, p = .03$) existed, was there a significant interaction effect between Proficiency and Frequency only for the Exceptional Causative Type ($F(4, 116) = 3.61, p = .00$), but not for the Prototypical Causative Type ($F(4, 116) = 0.42, p = .79$). Another notable result in the Transitive Frame is the effect size of the Frequency. The effect size of Frequency in the Exceptional Causative is considerably large ($\eta^2 = .50$), which shows that frequency alone can account for half of the participants' variability. In contrast, the effect size of Frequency in the Prototypical Causative is marginal ($\eta^2 = .02$).

In sum, the results suggest that the simple main effects of Proficiency and Frequency were primarily present in the Exceptional Causative Type. In addition, in the Transitive Frame, where the difference between L1 and L2 is the most contrastive, there was a tendency that low-proficiency L2 English participants to be subject to a stronger influence of frequency than the high-proficiency L2 participants and native-speaker participants.

7.2. Analysis with the mixed-effect linear model

Comparable analyses with using the mixed-effect model (fixed effects: Frequency, Proficiency, and their interactions; random effects: Verb and Participant) were carried out and their results are presented in Table 7 in Appendix. Although the patterns found in the mixed-effect analyses are largely similar to those in the mixed-design ANOVA, there are also a few differences. In contrast to the mixed-design ANOVA, the main effects and the interaction effects in the Transitive Frame are significant in both the Exceptional Causative Type and the Prototypical Causative Type. The main effect of Frequency (Log Frequency) in the Exceptional Causative Type ($\hat{\beta} = -0.79, p < .001$) is noticeably greater than the other effects, confirming the finding of the larger effect size of Frequency in the mixed-design ANOVA. . Frequency in the Prototypical Causative Type was not significant ($\hat{\beta} = -0.22, p = .12$), which suggests that the frequency effect mainly exists in the Exceptional Causative Type in the Transitive Frame.

A post-hoc analysis on only the data from the Transitive Frame was carried out with the mixed-effect model (fixed effects: Verb Type, Frequency, Proficiency, and their interactions; random effects: Verb and Participant). Since the expected judgment scores for the Transitive Frame differ between the Prototypical Causative Type (i.e., most acceptable=5) and the Exceptional Causative Type (i.e., least acceptable=1), the stimulus items expected to be judged as ungrammatical by native speakers of English were reverse coded prior to this analysis. In the model with all factors (full-model), only the intercept was significant and none of the fixed factors and their interactions was significant. Therefore, the full mixed-effect model was submitted to the stepwise likelihood test using the $\mathcal{R}$ package LMERConvenienceFunctions (Tremblay, 2012). By default, LMERConvenienceFunctions processes all fixed-effect in a backward elimination (like the backward step-wise analyses in multiple regression). At the first step of the analysis, the three-way interaction (Verb Type$\times$Frequency$\times$Proficiency) was removed since the simplified model was not significantly

different from the original full model ($p = .47$). In the subsequent steps, Verb Type$\times$ Proficiency ($p = .82$), Verb Type$\times$Frequency ($p = .13$), and Frequency ($p = .78$) were eliminated from the model. The remaining model retained Verb Type, Frequency, Proficiency, and Frequency$\times$Proficiency, all of which are significant or marginally significant as shown in Table 5.

Table 5: *A summary table of the mixed-effect linear model: Estimates of fixed-effect variables and p-values using the Markov Chain Monte Carlo approach (only Transitive Frame with both Exceptional and Prototypical Types: simplified model)*

	Estimate	MCMCmean	HPD95lower	HPD95upper	pMCMC	$Pr(>\|t\|)$
Intercept	2.4541	2.4413	0.8768	4.1337	0.0058	0.0022
verbType	-0.3587	-0.3585	-0.7291	0.0299	0.0610	0.0355
verbLogFreq	0.2010	0.2020	-0.0048	0.4044	0.0516	0.0432
englishLevel	0.0532	0.0534	0.0236	0.0816	0.0008	0.0003
verbLogFreq:englishLevel	-0.0052	-0.0052	-0.0090	-0.0012	0.0098	0.0088

8. Discussion

The asymmetric relationship predicts that L2 learners face difficulty when the usage of a certain language construction is wider in L2 than in L1. In this study, such difficulty is predicted in the Exceptional Causative Type, especially when these exceptional verbs are used in the Transitive Frame. The current data fit the predictions of the asymmetric relationship since Japanese native speakers learning English have more difficulty in making native-like judgments with the Exceptional Causative Type.

Significant effects of Proficiency and its interaction with Frequency were found in the Exceptional Causative Type, especially in Transitive Frame, but such effects were absent in the Prototypical Causative Type. In the mixed-design ANOVA (cf. Table 6), the interaction effect was absent in the Prototypical Causative Type. In the mixed-effect model (see Table 7), the significant effects in the Prototypical Causative Type were considerably weaker (i.e., lower estimated β) than those in the Exceptional Causative Type. This means that the non-native participants had difficulty in rejecting the ungrammatical transitive sentence with an inherently-directed motion verb or a verb of disappearance such as **The man descended the airplane* and **The man vanished the coin*. The significant interaction effects show that the low-proficiency L2 English learners had more difficulty with the Exceptional Causative Type (i.e., inherently-directed motion verbs and verbs of disappearance) than the high-proficiency and the native-speaker participants.

The strong effects in the Transitive Frame and the absence of or weakened main and interaction effects in the other two sentence frames are exactly what the asymmetric relationship predicts between Japanese and English. There is a clear pattern that the non-native participants had much less trouble in making native-like judgments with the Prototypical Causative Type, which do not constitute an asymmetric relationship. This supports the existence of the asymmetric learnability in SLA. Another supportive evidence is that the same non-native participants had less difficulty with the Prototypical Causative Type where no influence of L1 transfer is expected.

The large effect size of Frequency in the Exceptional Causative Type indicates that the amount of exposure to the verbs is a major influence on the acquisition of the Exceptional Causative Type where the usage of L1 grammar differs from L2. The role of frequency in recovering from the asymmetric learnability is rather critical, as suggested by the large effect size in the mixed-design ANOVA and the large estimated β in the mixed-effect model. This pattern nicely fits in the assumption that L2 learners transfer their L1 grammar usage to L2, some of which must be rectified with the provision of direct or indirect negative feedback. Even when the asymmetric learnability problem is expected, L2 learners will have less trouble with high-frequency items because they receive a sufficient amount of negative feedback. On the other hand, L2 learner will have trouble with low-frequency items for which they receive little negative feedback. In other words, we can interpret the frequency effect as evidence that L2 learners rely on exposure to the actual usage of the target verbs in the input as far as where the L1 Japanese usage constitutes a superset of the L2 English usage. It logically follows that the lack of a frequency effect in the Prototypical Causative Type indicates that L2 learners can perform in a native-

like manner with less reliance on the input owing to the other resource available for the L2 learners, which is, most naturally, their innate grammatical knowledge.

9. Conclusion

In this paper, I investigated the acquisition of the causative alternation of English verbs by native speakers of Japanese, especially the influence of L1 grammar and frequency. The data suggest that the Japanese native speakers learning English as an L2 fail to acquire a native-like performance when the L1 grammar usage constitutes a superset of the L2 grammar. The data also suggest that input (frequency) plays some role in acquisition on the asymmetric relationship is established between L1 and L2. Admittedly, the scope of this study is very limited since I only looked at two contrastive verb semantic classes. Further studies of other verb semantic classes (such as the Laugh (unergative) verb class) must be conducted to corroborate the findings of the current study.

Appendices

Table 6: *A summary table of the mixed-design ANOVA in Exceptional Causative Type and Prototypical Causative Type (The asterisk indicates $p < .05$)*

EXCEPTIONAL CAUSATIVE TYPE

AGENT INTRANSITIVE FRAME

Effect	df_{num}	df_{den}	F	p-value	η^2
englishLevel	2	58	4.10	0.02*	0.07
verbFreq	2	116	5.27	0.01*	0.04
englishLevel:verbFreq	4	116	3.00	0.02*	0.05

THEME INTRANSITIVE FRAME

Effect	df_{num}	df_{den}	F	p-value	η^2
englishLevel	2	58	0.34	0.72	0.01
verbFreq	2	116	11.51	0.00*	0.10
englishLevel:verbFreq	4	116	0.74	0.57	0.01

TRANSITIVE FRAME

Effect	df_{num}	df_{den}	F	p-value	η^2
englishLevel	2	58	6.46	0.00*	0.09
verbFreq	2	116	102.17	0.00*	0.50
englishLevel:verbFreq	4	116	3.61	0.01*	0.07

PROTOTYPICAL CAUSATIVE TYPE

AGENT INTRANSITIVE FRAME

Effect	df_{num}	df_{den}	F	p-value	η^2
englishLevel	2	58	1.45	0.24	0.03
verbFreq	2	116	6.75	0.00*	0.04
englishLevel:verbFreq	4	116	1.76	0.14	0.02

THEME INTRANSITIVE FRAME

Effect	df_{num}	df_{den}	F	p-value	η^2
englishLevel	2	58	4.14	0.02*	0.09
verbFreq	2	116	3.15	0.05*	0.02
englishLevel:verbFreq	4	116	0.74	0.57	0.01

TRANSITIVE FRAME

Effect	df_{num}	df_{den}	F	p-value	η^2
englishLevel	2	58	3.89	0.03*	0.07
verbFreq	2	116	3.56	0.03*	0.02
englishLevel:verbFreq	4	116	0.43	0.79	0.01

Table 7: *A summary table of the mixed-effect linear model: Estimates of fixed-effect variables and p-values using the Markov Chain Monte Carlo approach (Each Frame and Verb Type)*

EXCEPTIONAL CAUSATIVE TYPE

AGENT INTRANSITIVE FRAME

	Estimate	MCMCmean	HPD95lower	HPD95upper	pMCMC	$Pr(>\|t\|)$
Intercept	2.4530	2.4631	0.7384	4.1276	0.0086	0.0018
englishLevel	-0.0395	-0.0396	-0.0713	-0.0068	0.0154	0.0149
verbLogFreq	-0.0374	-0.0384	-0.2600	0.1825	0.7294	0.7068
verbLogFreq:englishLevel	0.0030	0.0030	-0.0013	0.0070	0.1544	0.1372

THEME INTRANSITIVE FRAME

	Estimate	MCMCmean	HPD95lower	HPD95upper	pMCMC	$Pr(>\|t\|)$
Intercept	3.7444	3.7491	2.0308	5.3952	0.0004	0.0000
englishLevel	0.0320	0.0319	-0.0033	0.0641	0.0632	0.0622
verbLogFreq	0.0772	0.0768	-0.1470	0.2920	0.4890	0.4447
verbLogFreq:englishLevel	-0.0043	-0.0043	-0.0086	0.0003	0.0544	0.0538

TRANSITIVE FRAME

	Estimate	MCMCmean	HPD95lower	HPD95upper	pMCMC	$Pr(>\|t\|)$
Intercept	9.5317	9.5169	5.8499	13.2123	0.0001	0.0000
englishLevel	-0.1228	-0.1228	-0.1819	-0.0662	0.0001	0.0000
verbLogFreq	-0.7901	-0.7881	-1.2707	-0.3017	0.0040	0.0012
verbLogFreq:englishLevel	0.0120	0.0120	0.0042	0.0194	0.0038	0.0017

PROTOTYPICAL CAUSATIVE TYPE

AGENT INTRANSITIVE FRAME

	Estimate	MCMCmean	HPD95lower	HPD95upper	pMCMC	$Pr(>\|t\|)$
Intercept	4.9769	4.9347	-0.0092	9.9309	0.0494	0.0345
englishLevel	-0.1138	-0.1134	-0.2060	-0.0238	0.0170	0.0117
verbLogFreq	-0.2930	-0.2875	-1.0349	0.4196	0.4204	0.3873
verbLogFreq:englishLevel	0.0143	0.0142	0.0016	0.0278	0.0378	0.0274

THEME INTRANSITIVE FRAME

	Estimate	MCMCmean	HPD95lower	HPD95upper	pMCMC	$Pr(>\|t\|)$
Intercept	2.4056	2.3937	-2.1452	6.9403	0.2952	0.2595
englishLevel	0.0501	0.0501	-0.0415	0.1447	0.2940	0.2772
verbLogFreq	-0.1066	-0.1069	-0.7698	0.5453	0.7568	0.7240
verbLogFreq:englishLevel	-0.0020	-0.0020	-0.0154	0.0113	0.7704	0.7590

TRANSITIVE FRAME

	Estimate	MCMCmean	HPD95lower	HPD95upper	pMCMC	$Pr(>\|t\|)$
Intercept	6.3945	6.3924	4.2976	8.4957	0.0001	0.0000
englishLevel	-0.0528	-0.0528	-0.0923	-0.0129	0.0092	0.0089
verbLogFreq	-0.2235	-0.2227	-0.5230	0.0881	0.1464	0.1196
verbLogFreq:englishLevel	0.0068	0.0068	0.0011	0.0126	0.0208	0.0178

References

Ambridge, Ben, Julian M. Pine, Caroline F. Rowland & Chris R. Young (2008). The effect of verb semantic class and verb frequency (entrenchment) on children's and adults' graded judgements of argument-structure overgeneralization errors. *Cognition* 106, 87–129.

Baayen, Harald R. (2001). *Word Frequency Distributions*. Springer, New York, NY.

Baayen, Harald R. (2008a). *Analyzing Linguistic Data: A practical introduction to statistics*. Cambridge University Press, Oxford.

Baayen, Harald R. (2008b). *The languageR Package*. CRAN.

Baayen, Harald R., R. Piepenbrock & L. Gulikers (1996). *CELEX2*. Linguistic Data Consortium, Philadelphia, PA.

Bates, Douglas (2008). Fitting linear mixed-effects models using the lme4 package in R. Presentation at Potsdam GLMM workshop.

Bley-Vroman, Robert & Naoko Yoshinaga (1992). Broad and narrow constraints on the English dative alternation: Some fundamental differences between native speakers and foreign language learners. *University of Hawaii Working Papers in ESL 11*, University of Hawaii, University of Hawaii, Manoa, HI, 157–199.

Brooks, Patricia J. (2004). Grammatical competence is not a psychologically valid construct. *Journal of Child Language* 31:2.

Brooks, Patricia J. & Michael Tomasello (1999a). How children constrain their argument structure constructions. *Language* 75:4, 720–738.

Brooks, Patricia J. & Michael Tomasello (1999b). Young children learn to produce passives with nonce verbs. *Developmental Psychology* 35:1, 29–44.

Brooks, Patricia J., Michael Tomasello, Kelly Dodson & Lawrence Lewis (1999). Young children's overgeneralizations with fixed transitivity verbs. *Child Development* 70:6, 1325–1337.

Ellis, Nick C. (2002). Frequency effects in language processing: A review with implications for theories of implicit and explicit language acquisition. *Studies in Second Language Acquisition* 24, 143–188.

Forster, Kenneth I. & S.M. Chambers (1973). Lexical access and naming time. *Journal of Verbal Learning and Verbal Behavior* 12, 627–635.

Gropen, Jess, Steven Pinker, Michelle Hollander, Richard Goldberg & Robert A Wilson (1989). The learnability and acquisition of the dative alternation in English. *Language* 65, 203–255.

Gropen, Jess, Steven Pinker, Michelle Hollander & Richard Goldberg (1991). Affectedness and direct objects: The role of lexical semantics in the acquisition of verb argument structure. *Cognition* 41:1-3, 153–195.

Harley, Heidi (2008). On the causative construction. Miyagawa, Shigeru & Mamoru Saito (eds.), *Handbook of Japanese Linguistics*, Oxford University Press, Cambridge, UK, 20–53.

Haspelmath, Martin (1993). More on the typology of inchoative/causative verb alternations. Comrie, Bernard & Maria Polinsky (eds.), *Causatives and transitivity*, John Benjamins, New York, NY, 87–120.

Hirakawa, Makiko & Kazunori Suzuki (2010). Learnability and modality restrictions on conditionals in L2 Japanese and English. *In Proceedings of the Second Language Research Forum 2010*.

Inagaki, Shunji (1997). Japanese and Chinese learners' acquisition of the narrow-range rules for the dative alternation in English. *Language Learning* 47:4, 637–669.

Inagaki, Shunji (2001). Motion verbs with goal PPs in the L2 acquisition of English and Japanese. *Studies in Second Language Acquisition* 23, 153–170.

Inagaki, Shunji (2002). Japanese learners' acquisition of English manner-of-motion verbs with locational/directional PPs. *Second Language Research* 18:1, 3–27.

Izumi, Shinichi & Usha Lakshmanan (1998). Learnability, negative evidence and the L2 acquisition of the English passive. *Second Language Research* 14:1, 62–101.

Jacobsen, W.M. (1992). *The Transitive Structure of Events in Japanese*. Kuroshio Publishers, Tokyo, Japan.

Lawrence, Michael (2011). *ez: Easy analysis and visualization of factorial experiments*. CRAN.

Levin, Beth (1993). *English Verb Classes and Alternations: A Preliminary Investigation*. The University of Chicago Press, Chicago.

MacWhinney, Brian (2000). *The CHILDES Project: Tools for Analyzing Talk*. Lawrence Erlbaum, Mahwah, NJ.

Marcus, Mitchell P., Grace Kim, Mary Ann Marcinkiewicz, Robert MacIntyre & Mark Ferguson (1994). The Penn Treebank: Annotating predicate argument structure. *ARPA Human Language Technology Workshop*.

Miyagawa, Shigeru (1998). *Sase* as an elsewhere causative and the syntactic nature of words. *Journal of Japanese linguistics* 16, 67–110.

Miyagawa, Shigeru (2002). Causatives. Tsujimura, Natsuko (ed.), *The Handbook of Japanese Linguistics*, Blackwell Publishers, Malden, Mass., chap. 8, 236–268.

Montrul, Silvina (2001a). Agentive verbs of manner of motion in Spanish and English as second language. *Studies in Second Language Acquisition* 23, 171–206.

Montrul, Silvina (2001b). First-language-constrained variability in the second-language acquisition of argument-structure-changing morphology with causative verbs. *Second Language Research* 17:2, 144–194.

Nedjalkov, Vladimir P. (1969). Nekotoryje verojatnostnyje universalii v glagol'nom slovoizmenenii. Vardul, I.F. (ed.), *Jazykovyjeuniversalii i lingvističeskaja tipologija*, Nauka, Moscow, 106–114.

Pinker, Steven (1989). *Learnability and Cognition*. MIT Press, Cambridge.

Pinker, Steven (2007). *The Stuff of Thought: Language as a Window into Human Nature*. Viking Adult, Boston, Mass.

R Development Core Team (2008). *R: A Language and Environment for Statisticsl Computing*. *R* Foundation for Statisticsl Computing, Vienna, Austria.

Reppen, Randi, Nancy Ide & Keith Suderman (2005). American National Corpus (ANC) second release. LDC.

Schwartz, Bonnie D. & Rex A. Sprouse (1996). L2 cognitive states and the full-transfer/full-access model. *Second Language Research* 12, 40–72.

Shibatani, Masayoshi (1976). Causativization. Shibatani, Masayoshi (ed.), *Syntax and Semantics*, Academic Press, Boston, Mass., vol. 5, 239–294.

Shibatani, Masayoshi (2004). The causative continuum. Shibatani, Masayoshi (ed.), *The Grammar of Causation and Interpersonal Manipulation*, John Benjamins, Cambridge, Mass., 85–126.

Testing and Certification Division English Language Institute, University of Michigan (2009). MELAB: Michigan English Language Assessment Battery information and registration bulletin.

Tremblay, Antoine (2012). *Package 'LMERConvenienceFunctions'*. CRAN.

Tsujimura, Natsuko (2002). Japanese *enter/exit* verbs revisited. *Studies in Language* 26:3, 165–180.

Tsujimura, Natsuko (2006). Why not all verbs are learned equally: The intransitive verb bias in Japanese. *Studies in Theoretical Psycholinguistics* 33:2, 105–122.

Yang, Charles (2008). The great number crunch. *Journal of Linguistics* 44, 205–228.

Yang, Charles (2010). Who's afraid of George Kingsley Zipf? Manuscript.

Zipf, George Kingsley (1949). *Human Behavior and the Principle of Least Effort*. Addison-Wesley, Cambridge, Mass.

Selected Proceedings of the 2011 Second Language Research Forum: Converging Theory and Practice

edited by Erik Voss,
Shu-Ju Diana Tai, and Zhi Li

Cascadilla Proceedings Project Somerville, MA 2013

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Nagano, Tomonori. 2013. Acquisition of English Verb Transitivity by Native Speakers of Japanese. In *Selected Proceedings of the 2011 Second Language Research Forum*, ed. Erik Voss et al., 1-18. Somerville, MA: Cascadilla Proceedings Project. www.lingref.com, document #2901.