Acquisition of English verb transitivity by native speakers of Japanese
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This on-going study is concerned with native Japanese speakers' acquisition of English verb semantic classes (Levin, 1993; Pinker, 1989), especially those in the causative alternation in English (Bowerman, 1974; Levin & Rappaport-Hovav, 1995, 2005).

Lexical causative is a long-standing problem in linguistics (Lakoff, 1965; McCawley, 1968; Fodor 1970). A large number of studies have been conducted on the acquisition of the lexical causative in English (Bowerman, 1974; Braine & Brooks, 1995; Brooks & Tomasello, 1999a, 1999b; Ambrdige et al., 2008). From the constructional perspective, *causativity* can appear into five structural frames. Constructions (2) and (3) are referred to as the *causative alternation* in the literature (Levin, 1993; Rappaport-Hovav & Levin 1998; Bowerman, 2008) and, together with the first construction, this phenomenon is often associated with verb unaccusativity (Perlmutter, 1978). The last two constructions have drawn lesser attention in English, but they are crucial frames when we consider the cross-linguistic influence of Japanese, which is known for its null-subject and null-object properties.

(1) Pure (unergative) Intransitive Frame : *Susan slept.*
(2) Unaccusative Intransitive Frame : *The ball bounced.*
(3) Causative Transitive Frame : *Michael bounced the ball.*
(4) Object-drop Intransitive Frame : *We already ate.*
(5) Pure (non-causative) Transitive Frame: *The boxer hit the pads.*

The acquisition research suggests that English-speaking children acquiring the causative alternation construction are sensitive to the semantic classes of verbs; that is, events indicating *change of state* (e.g., "break") or *manner of motion* (e.g., "bounce") are more likely to alternate between the transitive and intransitive constructions ((2) and (3)) than those verbs indicating *directed motion* (e.g., "descend") or a *appearing and disappearing event* (e.g., "die") (Brooks & Tomasello, 1999a, 1999b). Even within the same semantic class, a verb whose meaning is prototypical in the semantic class (e.g., "laugh" in the *involuntary action* verbs) is judged with a higher certainty than those atypical ones (e.g., "giggle").

Frequency effects are also repeatedly attested in language acquisition research (Ambridge et al., 2008; Bybee, 2006). In the *entrenchment effect hypothesis*, Braine & Brooks (1995) argue that frequent exposure to a token alleviates the learning problem and, therefore, high-frequency tokens are easy to acquire. This simple kind of frequency effect is facilitated by the natural tendency for learners to assume a unique mapping between the form and meaning (the *preemption effect*). Recent corpus-based studies indicate that frequency effects in language acquisition are considerably widespread since many linguistic distributions obey *Zipf's Law* (Zipf, 1949). Zipf's law states that rank of word and frequency of word are inversely proportional. Research shows that abstract linguistic units such as phrase-structure rules in Penn TreeBank and verb-object constructions in CHILDES also follow the Zipfian distribution (Yang, 2010). In other words, in linguistic distributions, there is one or a few highly frequent types in many linguistic distributions that are complemented with a large number of low-frequency types.

In this study, I looked at English language learners who are native speakers of Japanese, since these two languages show an interesting contrast in the way they encode lexical causativity. As

illustrated in Table 1, English lexical causative pairs are almost always labile, meaning that the same morphological form is used for both transitive and intransitive forms of the verb. Japanese lexical causative pairs are usually equipollent, meaning that both transitive and intransitive verbs are derived from the same morpheme without any systematic causative marker. For example, among roughly 16 different patterns of Japanese equipollent pairs, some markers, including *-e-*, are used for both the transitive member (e.g., *aku*/*ak-e-ru* "open$_{INTRANS}$/open$_{TRANS}$") and the intransitive member (e.g., *yak-e-ru*/*yaku* "burn$_{INTRANS}$/burn$_{TRANS}$) (Jacobsen, 1992). Unlike other languages such as Russian and French, whose intransitive members are usually morphologically derived from the transitive members, both English and Japanese have no reliable patterns in the ways that they mark lexical transitivity.

Table 1: Expression types of 31 causative verbs in various languages (Haspelmath, 1993; the original figure lists 21 languages in all)

	Total	Anticausative	Causative	Equipollent	Labile	Suppletive
Russian	31	23	0	5	0	3
French	31	20.5	2	0	7.5	1
Hebrew	31	20.5	7.5	2	1	0
Hindi-Urdu	31	7.5	14	7.5	2	0
Turkish	30	9	17.5	2.5	0	1
English	31	2	0	1	25	3
Japanese	31	3.5	5.5	20.5	0.5	1
Total	646	252	169	122.5	76.5	26
	100.00%	39.01%	26.16%	18.96%	11.84%	4.02%

In addition, Japanese appears to have a wider range of transitive pairs than English (Jacobsen,1992). For example, lexical causative pairs exist not only in (a) prototypical unaccusative verbs (e.g., *change-of-state verbs* such as *aku*/*akeru* "open$_{INTRANS}$/open$_{TRANS}$" and *manner-of-motion verbs* such as *korobu/korogasu* "roll$_{INTRANS}$/roll$_{TRANS}$"), but also in (b) unergative verbs (e.g., *verbs of involuntary bodily process* such as *naku/nak-asu* "cry$_{INTRANS}$/cry$_{TRANS}$"[1]), and (c) unaccusative verbs without the causative alternation in English (e.g., *inherently-directed motion verbs* such as *oriru/orosu* "descend$_{INTRANS}$/descend$_{TRANS}$" and *verbs of disappearance* such as *kieru*/*kesu* "disappear$_{INTRANS}$/disappear$_{TRANS}$").

Several SLA studies have investigated English-Japanese and Japanese-English L2 learners from the perspective of the learnability hypothesis (Gold, 1967). All studies, assuming some version of the learnability hypothesis, predict that learning difficulty arises when the L1 grammar is a superset of the target grammar, since learners will not receive any corrective feedback to rectify their interlanguage grammar. For example, Gabriele (Gabriele, 2009) looked at the acquisition of aspectual markers (English *-ing* and Japanese *–teiru*) in a bidirectional L2 study. She found that Japanese L2 leaners acquired the construction that exists in L1 but not in L2 (i.e., the resultative interpretation of *tsuite-iru* "arriving") more slowly than a completely new construction in L2. Thus, her study supports the expected learnability problem. Similarly, Ingaki (2001, 2002) examined the goal prepositional phrase [Manner-of-motion verb + goalPP] ("walked into the house") and [Directed-motion verb + goalPP] ("went into the house") in English and Japanese. Problems are expected for English native speakers as [manner-of-motion verb + goalPP] is acceptable in English, but not in Japanese (**ie-ni aruita* "walked into the house"). The results of his experiment supported this prediction. However, Hirakawa (2001) did not observe the expected learnability problem in his study on the classification of

[1] The morphological causative of *naku* is a homophone of the transitive form of the lexical causative *nakasu*. The lexical causative and morphological causative are homonyms since the lexical transitive causative *nakasu* can be attached with another morphological causative maker, resulting in *nakasasu* as in *Taro-ga Michiko-ni Kenji-wo nakasas-eta* ("Taro made Michiko cause Kenji to cry")

unaccusative/unergative verbs. Using a bidirectional design study, he found that both English L2 learners and Japanese L2 learners successfully acquired the distinction between unaccuative/unergative verbs in spite of the expected learnability problems.

In this study, I focus on three major predictions presented in the past literature; that is, the effects of verb semantic class, verb frequency, and the learnability problem. More specifically, I predict that:

- L2 learners are sensitive to verb semantic classes. For example, the closer the meaning of the verb to change of state in English, the more likely the L2 learner will identify the verb as a causative verb.
- With everything else being equal, high-frequency verbs will be easier to acquire than low-frequency verbs.
- Since Japanese has a richer inventory of transitivity pairs than English, the acquisition problem with English causative verbs will persist among even advanced learners of English whose native language is Japanese.

The experiment module was developed using Macromedia ActionScript3 (Reimers & Stewart, 2007). The procedure consisted of three parts: (1) Questionnaire (10min), (2) English proficiency assessment (with MELAB; 30min), (3) Grammaticality judgment task (45min). In the grammaticality judgment task, participants viewed video clips displaying an agent making different kinds of movements in a scene (see Figure 1). An English sentence describing the scene appeared following each video, and the subject was asked to rate the adequacy of the description on a 5-point Likert scale (from 1 to 5). Stimulus verbs were selected from six verb semantic classes, each of which have different grammaticality status in terms of transitivity frames.

(6) Verb semantic classes and verbs
- HIT and TOUCH verb*: smash, kick, strike, touch, kiss, tickle*
- OBJECT-DROP verb*: play, eat, bake*
- BODY-PART verb: *blink, shrug, wave*
- LAUGH verb: *laugh, cry, moan*
- GO and DISAPPEAR (irr unacc) verb: *go, descend, tumble, die, disappear, vanish*
- CHANGE-OF-STATE and ROLL (unacc) verb: *melt, crash, sink, move, roll, bounce*

Each verb appeared in three different frames. For example, the verb "vanish" appeared in "*The man vanished." (agent intransitive frame), "The coin vanished." (theme intransitive frame), and "*The man vanished the coin." (transitive frame).

Figure 1: Video clip for "*The man vanished.", "The coin vanished.", and "*The man vanished the coin."

Twenty-six native English-speaking subjects (control group) and 35 Japanese-speaking subjects (2 focus groups; 18 high-proficiency and 17 low-proficiency) participated in the experiment.

Grammaticality judgments were analyzed in a mixed design ANOVA with two within-subject variables (verb frequency (high, mid, and low) and verb semantic class) and one between-subject variable (English proficiency (native, high, and low)).

Results showed statistically significant effects for English proficiency level ($F(2, 58) = 6.68$, $p < .01$), verb frequency ($F(2, 116) = 3.09$, $p < .05$), and verb semantic class ($F(5, 290) = 24.08$, $p < .001$). There was also a two-way interaction between frequency and semantic class ($F(10, 580) = 5.48$, $p < .001$) and a three-way interaction among proficiency, frequency, and class ($F(20, 580) = 5.48$, $p < .05$). Post-hoc analyses of the three-way interaction were carried out with a series of two-way ANOVAs (Figure 2). In each semantic class, ANOVAs (within: verb frequency, between: English proficiency) showed that English proficiency level was significant only within BODY-PART verbs, LAUGH verbs, and IRR. UNACCUSATIVE verbs. Also, another two-way post-hoc RM ANOVA (within: verb frequency, between: English proficiency) showed a significant difference among the English proficiency groups only with low-frequency verbs ($F(1, 59) = 10.74$, $p < .001$), but not with high-frequency and mid-frequency verbs.

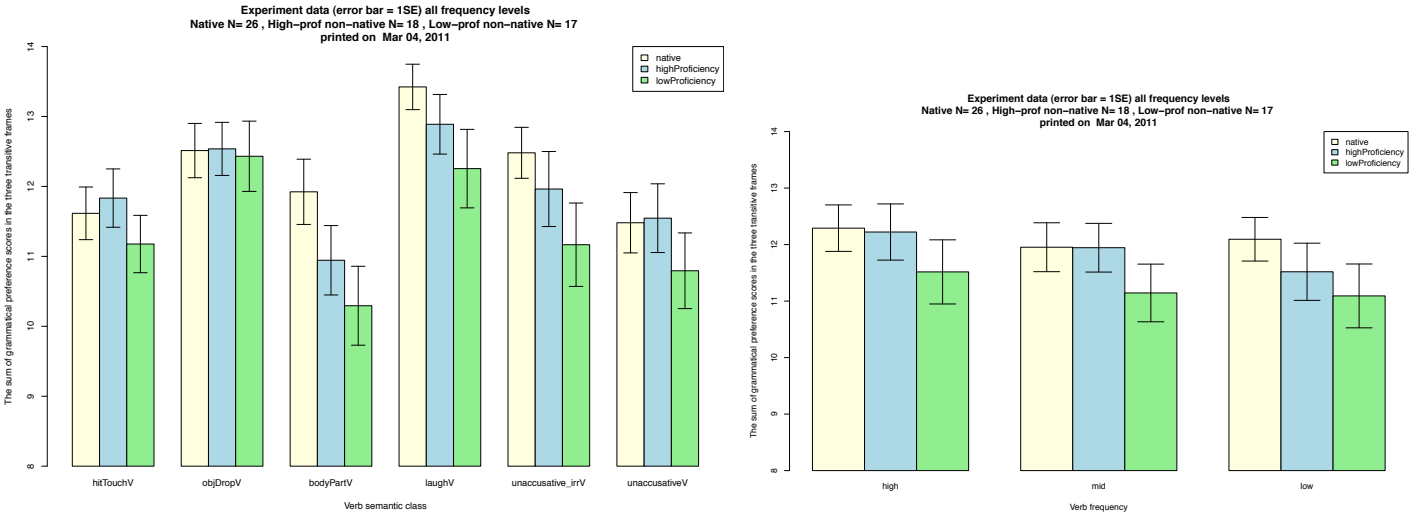

Figure 2: Bar plots for Post-hoc analyses

The data suggest that frequency effects do exist, but they interact with verb semantic class and English proficiency -- possibly, the more prototypical the verb, the less susceptible it is to the effects of frequency.

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