

# Linking Meaning to Language: Linguistic Universals and Variation

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**Running Title:** Linking meaning to language

**Key Words:** verbs; psychological states; argument structure; thematic roles

**Word Count:** 3,965

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## Acknowledgements:

The authors thank David Pesetsky for comments, and NDSEG (JH), the Allport Memorial Fund (JH), and the NSF (0921012; JS) for funding.

## Abstract

To communicate, speakers must place the different participants of an event (e.g., causal agent, affected entity) in predictable syntactic positions (e.g., subject, object) so that listeners will know who did what to whom. This mapping is often argued to be governed by *linking rules* that are consistent within each language and universal across languages. This hypothesis is challenged by verbs of psychological state: The experiencer of the state can appear as either the subject (*Mary fears/hates/loves John*) or the direct object (*Mary frightens/angers/delights John*). The present studies explore whether this variability may actually result from differences in these verbs' meanings. Specifically, we find that both English- and Japanese-speakers use the typical duration of a psychological state to guide novel verb learning, mapping the experiencer of a long-lived state onto subject-position and the experiencer of a short-lived state onto object-position. Thus, even these verbs are subject to universal mapping constraints.

To interpret the sentence *Mary broke the vase*, one must determine the kind of event described (*breaking*), the participants in that event (*Mary, the vase*), and which participant played which role in the event (*Mary*=breaker, not break-ee). Linguists have identified several regular mappings between semantic roles (agent/patient) and syntactic positions (subject/object), both within and between languages (see Levin & Rappaport Hovav, 2005, for review). For instance, in English—and perhaps all languages (Baker, 1988; Levin & Rappaport Hovav, 2005)—the direct object of a transitive change-of-state verb is the entity that changes state (the patient) while the subject is the entity that effects that change (the agent; cf *Mary broke/cleaned/opened the box*).<sup>1</sup> This generalization extends to novel words: Adults and children prefer an interpretation in which *The bear pilked the horse* means the bear did something to the horse, not vice versa (Marantz, 1982; Pinker, 1989). This preference to map agents to subjects and patients to objects is present in children as young as 20 months (Gertner, Fisher & Eisengart, 2006). Building on such findings, some theorists (e.g., Baker, 1988) have proposed that the mapping between syntax and semantics is characterized by exceptionless linking-patterns which are universal both across languages and across similar participant roles within a language.

While this *universal-linking-rules hypothesis* easily accounts for many classes of verbs across languages, it faces several challenges. On some analyses, a small number of *deep ergative* languages violate these generalizations and follow other patterns (see General Discussion). Within familiar non-ergative languages, problematic cases arise where verbs with apparently similar meanings map the same event participants onto different syntactic positions. An object moving from Mary's possession to John's can be described by *Mary gave the package to John* or *John received the package from Mary*. A single event might be called *Mary chasing John* or *John fleeing from Mary*. Verbs of psychological state can map the experiencer of the state onto subject position (*John feared/hated/loved Mary*) or object position (*Mary frightened/angered/delighted John*).

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<sup>1</sup> For simplicity, here and throughout we focus on active verbs, though the theories cited do address passivized verbs as well.

Many theorists, confronted with this conflict between broad regularities in linking-patterns and apparent counter-examples, take the counterexamples to heart, weakening the universal-linking-rules hypothesis, at least for some verbs (Dowty, 1991; Jackendoff, 1990; Pinker, 1984), or abandoning it entirely (Goldberg, 1995; Tomasello, 1992). The present study explores an alternative: apparent counter-examples may not be counter-examples at all. The universal-linking-rules hypothesis states that a verb's meaning determines the linking-pattern it follows, and thus verbs with similar meanings should follow the same linking-pattern. Although the examples above involve verbs that can describe the same events (*chase/flee*, *send/receive*, *fear/frighten*), this does not entail that they have the same meaning. The event in Figure 1 can be described in several ways: a) *Sally threw the ball to John*, b) *Sally threw John the ball*, or c) *Sally gave John the ball*. Each of these sentences has a slightly different meaning. (A) is true regardless of whether John catches the ball, while (b) and (c) require that he receives it. (C) is true regardless of how Sally moved the ball, while (a) and (b) require ballistic motion through the air.

This distinction between the event that a verb refers to and which aspects of the event it encodes (reception, ballistic motion, etc.) has proven extremely useful in linguistic theory, and most theories of linking-patterns focus on such encoded meaning (Levin & Rappaport Hovav, 2005).<sup>2</sup> Thus, if it can be shown that these problematic verbs that can describe the same events (*chase/flee*, *send/receive*, *fear/frighten*) systematically encode different aspects of those events, the apparent counter-examples would disappear.

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<sup>2</sup> Throughout, we use "semantics" to indicate encoded meaning.

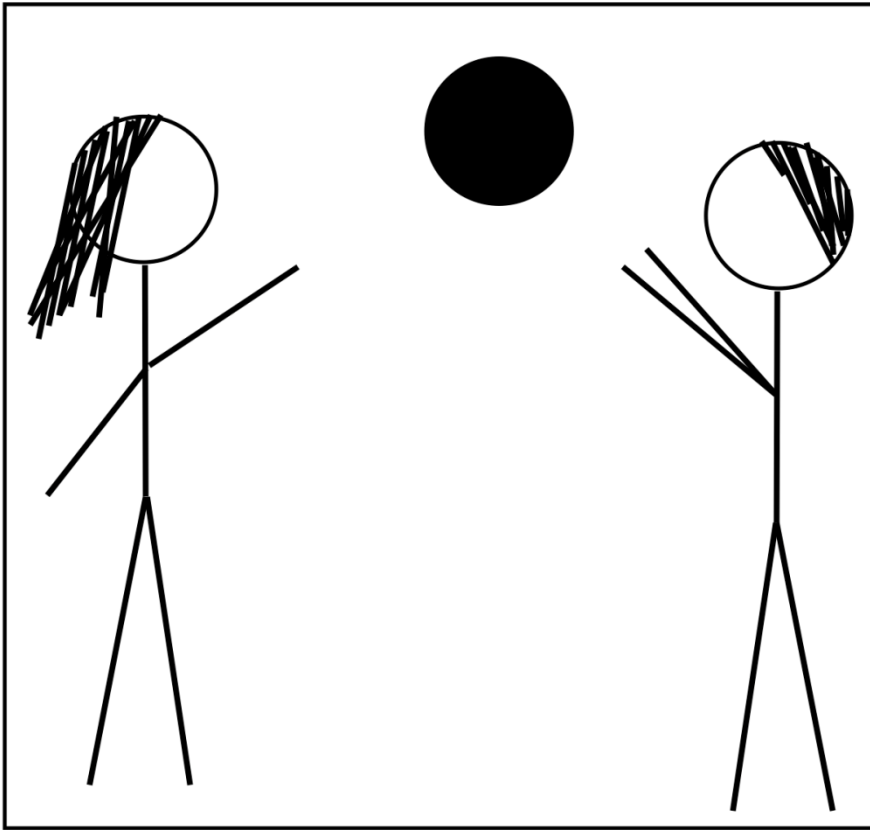


Fig. 1. An event, which may be described by many different verbs.

### Verbs of Psychological State

We focus on verbs of psychological state (“psych-verbs”), which either map the EXPERIENCER to subject and STIMULUS to object (*John feared/hated/loved Mary*) or EXPERIENCER to object and STIMULUS to subject (*Mary frightened/angered/delighted John*). These verbs are among the most frequently discussed problematic cases for the universal-linking-rule hypothesis, are relatively numerous (250+ in English), and are found in a wide variety of languages (Belletti & Rizzi, 1988; Bialy, 2005; Croft, 1993, *in press*; Dowty, 1991; Landau, 2010; Levin, 1993; Pesetsky, 1995; Pytkkanen, 1999).

Two lines of empirical research have been taken to suggest that experiencer-object verbs (*frightened/angered/delighted*) do not follow a universal linking-pattern: Second-language acquisition studies have noted particular difficulties with acquiring experiencer-object relative to experiencer-

subject verbs (Sato, 2003; White, et al., 1998; Montrul, 2001), and agrammatic aphasics show worse performance on experiencer-object verbs (Pinango, 2000; Thompson & Lee, 2009).

These results are nonetheless inconclusive. Close inspection of the second-language acquisition literature reveals that while speakers of languages which employ special morphological markers for experiencer-object verbs (see discussion of Japanese below) have difficulty acquiring experiencer-object verbs in languages which do not mark them morphologically (e.g., English), the reverse is not necessarily the case (Montrul, 2001), suggesting that this effect is due to first-language carry-over (an expectation that such verbs *should* be marked morphologically). Similarly, agrammatic aphasics are not globally worse at experiencer-object verbs; when the verbs are presented in passive form, they do *better* at experiencer-object verbs than experiencer-subject verbs. This could be explained by aphasics employing a compensatory strategy of putting the necessarily animate argument (the experiencer) in subject position. This would succeed for most active verbs (which typically have animate subjects) and fail for most passive verbs, consistent with the finding that they have particular difficulty with passives relative to actives (Grodzinsky, Pinango, Zurif & Draï, 1999).

Although psych verbs are generally viewed as a serious problem for the universal-linking-rules hypothesis, the hypothesis could be rehabilitated were it shown that experiencer-subject and experiencer-object verbs differ systematically in their encoded meaning. In fact, several such proposals have been made (Croft, *in press*; Grimshaw, 1990; Pesetsky, 1995; Pylkkanen, 1999). However, these accounts conflict with one another and with accounts in which the classes do not differ semantically, but there is no evidence yet that ordinary speakers perceive and utilize these distinctions in normal language production/comprehension.

The present study tests the psychological reality of one possible semantic difference between experiencer-subject and experiencer-object verbs. Specifically, we teach naïve participants new verbs that describe events that systematically differ in their length, and then we ask them to decide how those

verbs would be used in a sentence. This manipulation is motivated by Pyllkanen's (1999) observation that in Finnish, situations described by experiencer-object verbs can be bound to a particular time and place (*John frightened/angered/delighted Mary yesterday in the kitchen*), whereas those described by experiencer-subject verbs cannot be (*\*John liked/loved/hated Mary yesterday in the kitchen*).<sup>3</sup> Rather, the latter describe generic properties true over a long period of time. Interestingly, psychologists have also made a distinction between emotions (*fright/anger/delight*), which are defined as brief physiological states, and dispositions (*love/liking/hatred*), which are stable tendencies to feel a particular way (Ekman, 1999). If participants perceive this distinction and use it to guide verb learning, then we would expect them to systematically prefer the experiencer-subject linking pattern for long-lived states and the experiencer-object pattern for short-lived states. In Experiments 1 and 4, this prediction is tested in English.

The universal-linking-rules hypothesis posits that the same semantic distinctions should underlie linking-patterns in all languages. Thus, in Experiments 2 and 3, we investigate the same question in Japanese, which is historically unrelated to English and has a very different syntactic structure (Tsujimura, 1996). Importantly, its psych verb system differs from that of English in critical ways. Whereas transitive English psych-verbs are mostly experiencer-object (220 experiencer-object vs. 44 experiencer-subject; Levin, 1993), systematic investigation of Japanese revealed it strongly prefers experiencer-subject verbs (74 vs. 5 by our count). Additional morphologically-complex experiencer-object verbs can be formed in Japanese by adding the causative *-(s)ase-* affix to an experiencer-subject verb:

(1) a. Taro-wa koomori-o kowagat-ta.

Taro-TOP bat-ACC fear-PAST

Taro feared bats.

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<sup>3</sup> Specifically, she argues that the two classes can be distinguished by whether they encode stage-level or individual-level predicates in the sense of Carlson (1977).

- b. Koomori-wa Taro-o kowagar-ase-ta.  
bat-TOP Taro-ACC fear-CAUS-PAST  
Bats frightened Taro.

Thus, in Japanese morphology is a highly-reliable predictor of argument-realization in psych-verbs. If state duration nevertheless influences argument-realization, this would provide striking evidence that this aspect of the syntax-semantics interface is cross-linguistically robust.

### Experiment 1: English

#### Method

Sixteen Japanese nouns describing psychological states without clear English verbal equivalents were selected and turned into verbs, applying any necessary phonological accommodations. Based on a description of the psychological state, participants were asked to choose between an experiencer-subject or experiencer-object usage of the verb:

(2) *douyo*: uneasiness.

- a. Ken douyos the unexpected exam.
- b. The unexpected exam doyous Ken.

The experiencer of the state was unambiguous: Only one argument of the verb was animate (e.g., Ken). Eight verbs described short-lived states (*uneasiness*) and were paired with short-lived STIMULI (*the unexpected exam*). Eight described long-lived states (*mental dependence*) and were paired with long-lived STIMULI (*the Japanese bureaucratic system*). Four additional filler sentences not involving psych verbs were included.

To test generality, verbs were presented in both present tense (Experiment 1a) and past tense (Experiment 1b). Verbs were presented in simple tenses, as experiencer-subject verbs cannot naturally used in progressive form in English (*\*John was fearing bats*), we used simple tenses only. The order of

verbs was pseudo-randomized such that the same condition (short-lived/long-lived) did not occur more than twice in a row. Four test forms for each experiment were created for each experiment by counterbalancing the order of stimuli (forwards/backwards) and the order of the sentence pairs. Five unique English-speaking adults participated in each test form, for a total of 20 in Experiment 1a and 20 in Experiment 1b.

## Results and Discussion

As Figure 2 indicates, participants were more likely to choose the experiencer-object form for short-lived events than for long-lived events, in both Experiment 1a (M=68%, SE=9% vs. M=38%, SE=7%,  $d=1.4$ ) and 1b (M=67%, SE=9% vs. M=41%, SE=9%,  $d=1.0$ ).<sup>4</sup> The main effect of state duration was significant ( $F_1(1,38)=60.8, p<.001$ ;  $F_2(1,14)=6.2, p=.03$ ), but the main effect of tense was not ( $F_s<1$ ) nor was the interaction of tense and duration ( $F_s<1$ ). Thus, English-speakers use the semantics of psych-verbs to guide learning of new psych-verbs.

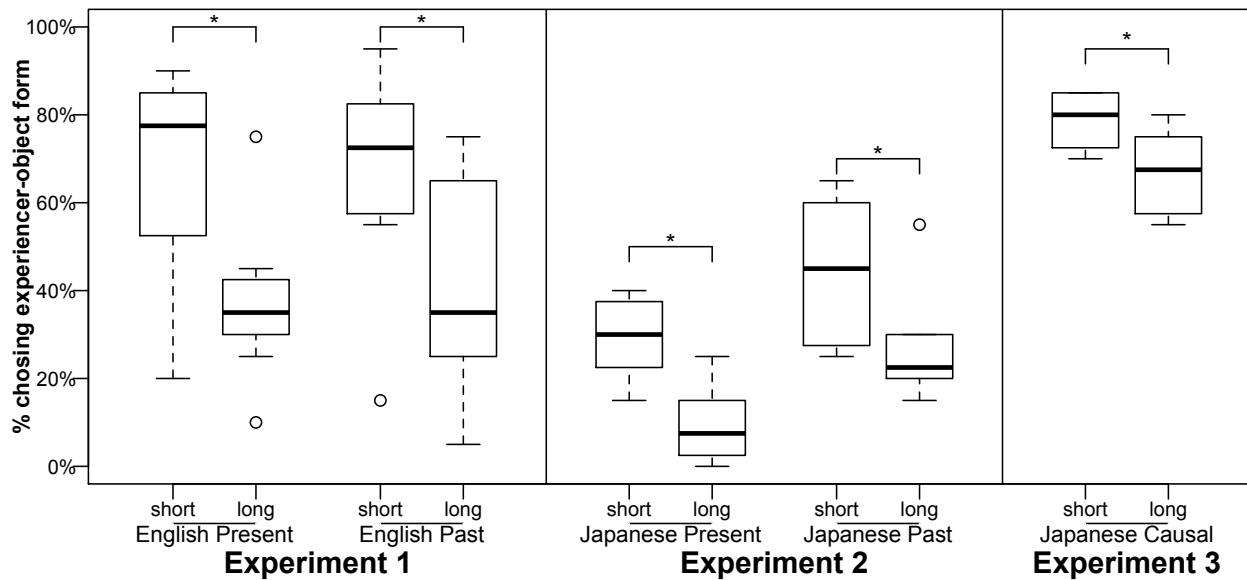


Fig. 2. Percentage of participants choosing the experiencer-object form for each *verb* for English verbs (Exp. 1), monomorphemic Japanese verbs (Exp. 2), and causally-affixed Japanese verbs (Exp. 3).

<sup>4</sup> Because generality of the effect across items is of core interest, means, standard errors and Cohen's  $d$  are here and elsewhere calculated by items. ANOVAs are calculated by both subjects and items.

## Experiment 2: Monomorphemic Japanese Psych-Verbs

### Method

Experiment 2 was Experiment 1 in Japanese. Sixteen English nouns describing psychological states without clear Japanese verbal equivalents were selected and turned into verbs, applying any necessary phonological accommodations. We created loanwords using the semantically neutral, semi-productive verbalizer *-r-* (e.g., *gugu-r-u*: ‘to google’). Again, eight states were long-lived (*greed*) and eight were short-lived (*grief*). An example trial is given below:

(4) *guriifu* (*grief*): deep sorrow (especially that caused by someone's death)

a. Tooru-wa aiken-no shi-o guriifu-t-tei-ru

Toru-TOP pet.dog-GEN death-ACC grief-V-PROG-PAST

Toru grieves the pet dog's death.

b. Aiken-no shi-wa Tooru-o guriifu-t-tei-ru

pet.dog-GEN death-TOP Toru-ACC grief-V-PROG-PAST

The pet dog's death grieves Toru.

The four filler verbs (2 experiencer-subject) were existing English-derived psych-verbs formed with the light verb *-suru*. All verbs were presented with progressive morphology, which was judged by native speakers (YS & MU) as the most natural form. Experiment 2 was identical to Experiment 1 in all other respects. Japanese-speaking adults were recruited in public spaces around Tokyo. Twenty participated in the present-tense version (2a), and twenty in the past-tense version (2b).

### Results and Discussion

Like English speakers, Japanese participants (Figure 2) were more likely to select the experiencer-object form for the short-lived verbs than the long-lived verbs in both Experiments 2a (M=29%, SE=3% vs. 9%, M=3%,  $d=2.3$ ) and 2b (M=44%, SE=6% vs. M=27%, SE=4%,  $d=1.2$ ). There were significant main effects of state duration ( $F1(1,38)=28.6, p<.001$ ;  $F2(1,14)=16.8, p=.002$ ) and

tense ( $F1(1,38)=6.3, p=.02; F2(1,14)=21.5, p<.001$ ), but the interaction was not significant ( $F_s<1$ ). Thus, Japanese-speakers, like English-speakers, utilize semantics (specifically, state duration) when learning new psych-verbs.

### **Experiment 3: Causative-Affixed Japanese Psych-Verbs**

#### **Method**

The materials and procedure were identical to Experiment 2b, except all verbs were causativized by the addition of the *-(s)ase-* affix and presented in the present progressive (*guriifu-r-ase-tei-ru*).

Twenty Japanese-speaking adults recruited in public spaces around Tokyo participated.

#### **Results and Discussion**

Although Japanese-speakers were more likely to choose the experiencer-object forms relative to Experiment 2a ( $M=73\%, SE=3\%$  vs.  $M=19\%, SE=3\%$ ;  $t1(38)=10.3, p<.001; t2(15)=20.5, p<.001; d=4.5$ ), they nonetheless preferred the experiencer-object form more for the short-lived states than the long-lived states (Figure 2;  $M=79\%, SE=2\%$  vs.  $M=67\%, SE=3\%$ ;  $t1(19)=2.41, p=.03; t2(14)=2.83, p=.01; d=1.4$ ).

### **Experiment 4: States and Stimuli**

Before discussing the above results, we address one final question about the source of the short-lived/long-lived distinction presented above. In Experiments 1-3, we biased participants to interpret novel verbs and short-lived or long-lived both with the definition of the psychological state (*uneasiness* vs. *mental dependence*) and the longevity of the inanimate stimulus (*the unexpected exam* vs. *the Japanese bureaucratic system*). There are two ways in which choice of stimulus could affect judgments. First, short-lived and long-lived stimuli may reinforce the interpretation of the psychological states as short- or long-lived. This was our original intention and would strengthen the above conclusions. However, it is also possible that participants used linking-patterns that mapped particular kinds of noun-

phrases to subject or object position, entirely ignoring the verb's meaning.

In Experiment 4, conducted in English, we test whether the psychological state definitions by themselves are sufficient to guide psych verb learning. The experiencer and stimulus of the psychological state were both humans.

## **Method**

*Participants.* Forty English-speaking US residents were recruited through Amazon Mechanical Turk. An additional 12 were excluded for failing to follow directions or for reporting dyslexia.

*Materials.* The 16 definitions from Experiment 1 were used. A separate group of 16 English-speaking participants recruited through Amazon Mechanical Turk rated each state (in lists counterbalanced by order) according to how long it would likely last: seconds, minutes, hours, days, weeks, months or years. Based on these ratings, the stimuli were divided into eight short-lived and eight long-lived states.

*Procedure.* Participants were introduced to a novel character "Susan" who has many emotional relationships with friends. For each friend, participants were told Susan experienced one of the 16 psychological states. Participants were asked to produce a three-word sentence using the novel verb that described this state and both character's names. All verbs were presented in the past tense. The two counter-balanced orders from Experiment 1 were used; fillers were not included.

## **Results and Discussion**

Once again participants were more likely to link the experiencer (Susan) with object position for short-lived relative to long-lived states (Figure 3;  $M=52\%$ ,  $SE=6\%$  vs.  $M=24\%$ ,  $SE=6\%$ ;  $t_1(39)=7.20$ ,  $p<.001$ ;  $t_2(14)=3.25$ ,  $p=.01$ ;  $d=1.6$ ). These results confirm that the perceived length of the psychological state guided the choice of linking rule. While the inanimate arguments used in Experiments 1-3 may have made additional contributions, the present results show that the expected duration of the psychological state alone is sufficient.

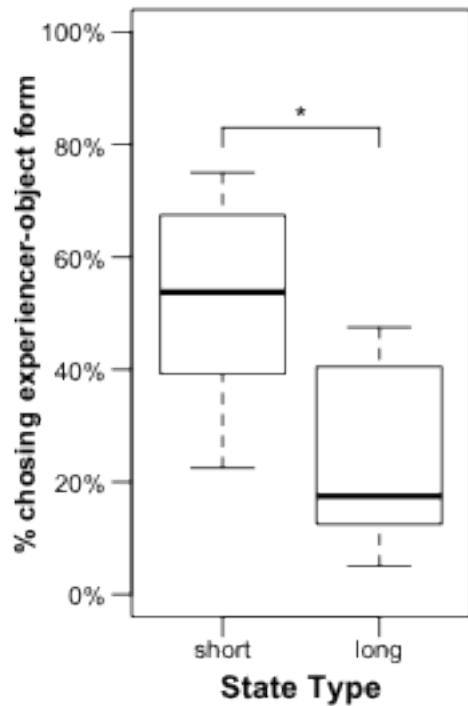


Fig. 3. Percentage of participants choosing the experiencer-object form for each *verb* in English (Exp. 4).

### General Discussion

To communicate about events and states, speakers must map participants onto syntactic roles (subject/object/etc.). The existence of cases where the same argument roles are mapped onto distinct syntactic positions presents a challenge for the universal-linking-rules hypothesis. In this paper, we examined one of the most widely-discussed cases of this kind: psych verbs, which exhibit two distinct linking-patterns, either mapping the EXPERIENCER of the psychological state to subject position and the STIMULUS of the state to object position (*fear/hate/love*) or vice versa (*frighten/anger/delight*). Following

Pylkkanen (1999), we propose that this distinction in linking-patterns mirrors a distinction in verb semantics: experiencer-subject verbs describe long-lived states; experiencer-object verbs describe short-lived states.

Across four experiments, we find that this distinction is psychologically real and guides the learning of novel verbs. These effects were robust, exhibiting large effect sizes (Cohen's  $d_s \geq 1$ ) across different verb tenses and morphological forms. The effect was found in both English (Exps. 1 & 4) and Japanese (Exps. 2-3) and was suggested by an analysis of existing Finnish verbs (Pylkkanen, 1999)--three historically and grammatically distinct languages--suggesting that the phenomenon is cross-linguistically robust.

Critically, the presence of this effect in Japanese strongly suggests that it does not arise by a simple analogy between the novel verb and known verbs. In Japanese, experiencer-object verbs are created by applying the causative morpheme to experiencer-subject verbs. Thus there are no causative experiencer-subject verbs and few monomorphemic experiencer-object verbs. Nevertheless, when confronted with a causative verb that described a long-lived psychological state or monomorphemic verb describing a short-lived state, about 30% of our Japanese participants overrode the language-specific morphological cues and followed this cross-linguistic semantic generalization.

In the remainder of this discussion, we examine: 1) alternative hypotheses about the semantic distinction that underlies these effects; 2) how different theories of linking-patterns might account for the crosslinguistic similarities and differences revealed in these studies, and; 3) the implications of these results for other challenges to the universal-linking-rules hypothesis.

### **Causes, Stages and Emotions**

The experiments demonstrate that short-lived emotions are more likely to be expressed with experiencer-object verbs. There are three ways in which event duration could influence linking-patterns.

First, the duration of the emotion could be directly encoded into the linking-patterns. While this proposal provides a simple explanation of our data, we know of no other cases in which temporal duration of a state is associated with different linking-patterns.

Second, the duration of an emotion could influence whether the sentence is interpreted as encoding an unchanging state or an event where an entity shifts from one state to another (a change-of-state event). On some accounts (e.g., Tenny, 1994), change-of-state verbs are distinguished by having one argument which measures out the event. In a transitive sentence this participant always surfaces as the direct object: In *Mary broke/cleaned/opened the box*, “the box” must be the direct object because it is the box’s state – not Mary’s state – which determines whether any breaking, cleaning or opening has been done. Because short-lived psychological states by definition come and go, they may be more likely to be conceived as change-of-state verbs. On Tenny’s (1994) account, when a change of state involves an emotion, the experiencer measures out the event and surfaces as the direct object (*frighten/anger/delight*). In contrast, long-lived psychological states (*fear/hate/love*) may be more readily conceived of as stable states; no event is measured out and the experiencer-object pattern is not required. Why the experiencer-subject form is preferred for these verbs must be explained through some other mechanism (e.g., a preference to link animate agents with subject position; Dowty, 1991).

Third, the duration of an emotion could influence whether it is conceived of as having an external cause. Several researchers (Grimshaw, 1990; Pesetsky, 1995; Talmy, 1985; Pytkkanen, 1999) have argued that experiencer-object verbs explicitly mark the STIMULUS argument as the *cause* of the psychological state. Causes are robustly linked with subject position across languages (Baker, 1988; Pinker, 1984; Levin & Rappaport Hovav, 2005), which would account for linking-pattern of these verbs. In contrast, on this theory experiencer-subject verbs do not express the cause but simply assert that the experiencer is having an emotional state with a particular target or content, thus a default linking rule mapping animate entities onto subject position may apply. This proposal is supported by the fact that in

languages with causally-affixed psych-verbs (like Japanese), these verbs are experiencer-object.

Thus, people may prefer to encode short-lived psychological states as experiencer-object verbs because they wish to talk about the change of state (and thus link experiencer to object position), they wish to talk about the cause of the state (and thus map the stimulus onto subject position), or both. In either case the semantic distinction underlying these effects is one relevant to a broad range of predicates.

### **Universals**

If indeed the linking-patterns discussed in this paper are cross-linguistically universal, theories on which linking-patterns are learned (Goldberg, 1995; Tomasello, 1993) must appeal to other universal constraints. For instance, some patterns in language may result from constraints on optimal transfer of information (Piantadosi, Tily & Gibson, 2011). Whether similar considerations can explain linking-patterns is an open question. Theories on which some or all linking-patterns are innate (Dowty, 1991; Pesetsky, 1995; Pinker, 1984) trivially predict cross-linguistic universality; the primary challenges to such accounts are to a) explain how linking-patterns are encoded biologically, and b) account for any residue of cross-linguistic variation.

### **Variation**

Although speakers of both languages were sensitive to psychological state duration, English-speakers were far more likely than Japanese-speakers to choose the experiencer-object form for monomorphemic verbs ( $M=53\%$ ,  $SE=7\%$  vs.  $M=28\%$ ,  $SE=4\%$ ;  $t1(78)=5.8$ ,  $p<.001$ ;  $t2(30)=3.5$ ,  $p=.001$ ;  $d=1.2$ ). The effect is large and consistent across items ( $d=1.2$ ), suggesting that small, accidental variations in items are not to blame. All but one of the short-lived English verbs in Experiment 1a had more experiencer-object attributions than *any* of the short-lived Japanese verbs in Experiment 2a and all but one of the long-lived English verbs in 1a had more experiencer-object attributions than *any* of the long-lived Japanese verbs in 2a.

Instead, we suspect that this pattern reflects the difference in the morphological structure of psych-verbs in these languages. As noted earlier, in Japanese most monomorphemic psych-verbs have experiencer subjects, while experiencer-object verbs are created from experiencer-subject verbs by applying the *-(s)ase* affix. Our participants clearly knew this and applied this knowledge in our task: verbs with the causative affix were expressed with experiencer-subjects twice as often as monomorphemic verbs.

It may be that when Japanese speakers encounter a causally-affixed verb, they infer that it encodes a caused change-of-state, even if the event is fairly long in duration, resulting in semantics appropriate for an experiencer-object verb. In contrast, when they encounter a monomorphemic verb, they infer that it does not describe a caused change-of-state, resulting in semantics appropriate for an experiencer-subject verb. Because English does not explicitly mark verbs as causal or not, the English-speaking participants were more open to both possible interpretations of the novel verb. This possibility accounts for cross-linguistic variation while maintaining the exceptionless-linking-rule hypothesis.

Alternatively, it may be that English-speakers and Japanese speakers conceived of the verbs in the preceding experiments in the same way, and that despite a cross-linguistic bias to encode long-lived states as experiencer-subject verbs, language-specific linking-patterns nonetheless are modified by linguistic experience. Japanese-speakers may have learned that monomorphemic psych verbs are likely to have experiencer-subjects (even if they encode a change-of-state) while English speakers have not. This proposal is similar in spirit to recent work implementing overhypotheses – hypotheses about hypotheses – in hierarchical Bayesian models (e.g., Perfors, Tenenbaum & Wonnacott, 2010).

### **Conclusions**

Cases where two verbs that appear to describe the same type of situation but are governed by different linking-patterns are problematic for theories proposing that linking-patterns are predictable from universal principles. In this study we presented evidence that one well-known problematic case—

psych verbs—are perhaps less problematic than they appear. Similar considerations may apply to other relevant verbs. For instance, while the same event may be described by both *chase* and *flee*, the verbs are not strictly synonymous: one may flee an earthquake without being chased by it, and while many dogs chase cars, the car is rarely fleeing. Thus, it may be that semantic differences can explain the apparently contrasting linking-patterns in all cases, which remains a topic for future research.

Nonetheless, it is clear that theories must be able to address cross-linguistic variation in some way—not only variation in morphology-related preferences for linking-patterns as exhibited in the present study, but also variation related to ergativity. Deep ergative languages appear to flip the transitive change-of-state pattern, mapping agents onto object and patients onto subject. It should be noted that this analysis of such languages must be viewed as preliminary in comparison to widely-studied languages such as English and Japanese and is in any case highly controversial (Dixon, 1994; Levin, 1983; Levin & Rappaport Hovav, 2005; Marantz, 1984). More research is clearly needed, and the above results point to one intriguing possibility, which is that the encoded semantics of verbs in such languages differs fundamentally from those in more familiar nominative-accusative languages such as English or Japanese.

In conclusion, we suggest that paying attention to subtle differences in the encoded semantics of verbs may inform, and perhaps resolve, long-standing debates concerning linking-patterns and the relationship between semantics and syntax.

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