Causers in English, Korean, and Chinese and the individuation of events

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Abstract

The kinds of entities that can be described as causing an event depend, in part, on the language one speaks. Whereas in English and Chinese it is possible to say The knife cut the bread *or* The key opened the door, *in Korean and many other languages, such sentences sound very odd. According to the* initiator hypothesis*, languages fall into two major groups with respect to possible external arguments in causal expressions: those that require that the causer be capable of generating its own energy and those that require only that the causer participate in the causal chain leading up to a particular result. In support of this hypothesis, we show that ability to self-energize has a larger impact on acceptability ratings in Korean than in either English or Chinese (Exp. 1). We also show that restrictions on possible causers extend to the semantics of possible causes in the descriptions of animations depicting causal chains (Exp. 2). Finally, we show that cross-linguistic differences in the linguistic coding of causers may have consequences for the way people conceptualize animations of causal chains in terms of number of events (Exp. 3). Implications for the representation of verb meaning and the semantics of external arguments in other languages are discussed.*

Keywords
causatives, lexical semantics, subjecthood, language and thought, cross-linguistic comparisons, event perception, event individuation

1. Introduction

Languages differ with respect to which aspects of an event are encoded in their grammar. In this paper we look at the implications of this selectivity

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for the linguistic coding and individuation of causal events. We will argue that while the meanings of various causal verbs might be much the same across languages, the constraints imposed on their meanings by the surrounding grammatical structures differ; in particular, languages can vary in the constraints they impose on the external arguments of a causal verb, which then affect how those verbs are used.

The central phenomenon of interest is illustrated by the sentences in (1). In English, all of the sentences in (1) are acceptable descriptions of causal events. However, as we will see, in many languages, only 1a is acceptable, while 1b and 1c are bad (Alexiadou and Schäfer 2006; Folli and Harley 2007; Guilfoyle 2000; Levin 2005; Van Voorst 1996). In other words, in some languages, simple objects like knives and keys cannot be described as causers. If you ask a German speaker, for example, whether a knife can cut bread, they might point out that knives do not have "arms and legs that would enable them to do this," as one of our language consultants told us (see Wolff et al. in press).

(1)   a.   The boy broke the window.
       b.   The knife cut the bread.
       c.   The key opened the door.

In this paper, we attempt to identify the semantic constraints on causer arguments within English and across languages, and then discuss the consequences of these constraints for language and cognition. In Experiment 1, we demonstrate systematic differences across languages with respect to the range of acceptable external arguments, specifically, English and Chinese allow a greater range of entities in the external argument position than does Korean. In Experiment 2, we show that the hypothesized differences extend to English, Chinese, and Korean speakers' descriptions of animated causal events. Finally, in Experiment 3, we show that differences in constraints on external arguments are associated with differences in how speakers of different languages individuate causal chains into events.

1.1.   *External arguments and causers in English*

We are interested in the characteristics of entities that make good external arguments, or causers, in sentences that describe causal relationships.[1]

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1.   This is important because the criteria that license external arguments in causal sentences may differ from the criteria that license external arguments in sentences describing non-causal relationships (Grimm 2007). For example, while the sentence *The fork moved the potato* sounds odd, the sentence *The fork stabbed the potato* sounds fine; the first sentence describes a causal relationship while the latter does not.

External arguments are typically associated with the semantic roles of "agent", "instrument" or "theme" (Radford 1988). The concept of an external argument is defined in various approaches to grammar in configural terms. For example, in the sentences *Alison petted the guinea pig* the second argument of the verb, *guinea pig*, is positioned inside the verb phrase while the first argument, *Alison*, is positioned outside the verb phrase, and hence is referred to as an external argument (Radford 1997). In generative grammar, the external arguments are effectively coextensive with the grammatical relation subject (Van Valin and LaPolla 1997). In this paper, however, we focus on external arguments rather than subjects because the behavioral and coding properties of "subjects" vary considerably across languages (Van Valin and LaPolla 1997). Indeed, as argued by LaPolla (1993, 2009), Mandarin Chinese may completely lack the grammatical category of subject. We focus on the notion of external argument because it offers a more universal, language-neutral category of analysis, and we are especially interested in the range of possible causers across languages. Our claim will be that languages differ in the range of types of semantic roles that can appear in the external argument position.

1.2. *Expressing causation in English*

Causation can be expressed in a variety of ways in English and in other languages (for a review, see Wolff et al. 2005). One such way is by means of a lexical causative. A lexical causative (e.g. *open*, *break, melt*) expresses a causal relation in a single clause and includes a causer, causee, and a change of state. In the lexical causative in (2a), Alison (the causer) causes the door (the causee) to become open (change of state).

(2) a. Alison opened the door.   (lexical causative)
     b. Alison caused Nathaniel to open the door. (periphrastic causative)
     c. Alison caused the key to open the door.   (periphrastic causative)

Another way to describe causal relationships is with a periphrastic causative. Periphrastic causatives express causal relationships (broadly construed) with two verbs, one each associated with the cause and the result (Baron 1977; Radford 1988; Shibatani 1976; Wolff 2003; Wolff et al. 2005). For example, in the sentences in (4b, c), the matrix verb, *caused*, expresses the notion of CAUSE while the embedded verb, *open*, expresses a particular end state or result. Periphrastic causatives are typically analyzed as composed of two clauses, a main clause and an embedded clause (Radford 1988). Such an analysis is not straightforward since it may at first glance appear as if the embedded clauses in (2b) and

(2c) lack subjects. Indeed, in most syntactic analyses of the sentences in (2b) and (2c), the NPs immediately following the matrix verb (*Nathaniel, the key*) function as the objects of the matrix verbs. The assumption, then, is that there exists a covert 'empty' external argument in the embedded clause (Radford 1988; Polinsky and Potsdam 2003; Jackendoff and Culicover 2003). In periphrastic causatives, the referential properties of this covert external argument, represented atheoretically by the symbol Δ, depend on the object in the matrix clause, and hence are referred to as 'object control' structures (Polinsky and Potsdam 2003; Jackendoff and Culicover 2003). The referent of covert external argument in the embedded clause in (2b) is the object of the matrix clause, as indicated by the shared subscript in (3).

(3)   Alison caused Nathaniel$_i$ [Δ_i to open the door]

An important question is how the controller of the covert external argument is determined, in particular, whether the control is determined primarily on the basis of syntactic or semantic criteria (Jackendoff and Culicover 2003). For present purposes, we will sidestep the question of how these control relations are determined and will simply assume that these relations are put in place. As a consequence, we can say, somewhat inaccurately, that the NP which follows the matrix verb in periphrastic causative structures serves two roles: it functions directly as the object of the matrix verb, and indirectly, through indexing, as the external argument of the embedded verb (Radford 1988, 1997). Another issue we wish to emphasize is the direction of the dependency between the object in the matrix clause and the covert external argument in the embedded clause. Traditionally, the nature of this dependency was viewed as wholly one-directional, with the referential properties of the embedded external argument determined by the object in the matrix clause (Kwon and Polinsky 2006; Jackendoff and Culicover 2003). However, in this paper, we investigate the possibility that constraints on the referential properties of possible external arguments might also restrict the range of possible objects of the matrix verb.

Besides differing in syntax, lexical and periphrastic causatives differ in their semantics. Whereas periphrastic causatives can express either direct or indirect causation, lexical causatives imply direct causation (e.g. Levin and Rappaport Hovav 1995; Pinker 1989; Shibatani 1976; Song and Wolff 2005; Wierzbicka 1988; Wolff 2003; among others). For example, the lexical causative in (2a) implies a situation in which Alison made direct physical contact with the door, for example, by turning the doorknob and pushing the door open. The periphrastic causative in (2c) implies a situation where Alison did something, such as starting to smoke,

that indirectly prompted the causee, Nathaniel, to open the door to get fresh air.

1.3.   *The semantics of causer external arguments in English*

English allows for a wide variety of entities in the external argument position of causal expressions. Although external causer arguments are often animate entities, as in (2), animacy is not required. As shown in (4), natural forces can be external arguments (Fillmore 1968).

(4)   a.   Lightning killed the guard.
      b.   The wind opened the door.

Like animate entities, natural forces can generate their own energy (Alexiadou and Schäfer 2006; Cruse 1973; Grimm 2007; Schlesinger 1989). Projectiles are another type of inanimate entity that can readily appear as the external argument of a causal sentence (Cruse 1973; Grimm 2007; Kearns 2000), as exemplified in (5).

(5)   a.   The stone broke the window.   (Kearns 2000)
      b.   The bullet killed the president.   (Schlesinger 1989)

Projectiles acquire their energy from an external force, but that energy seems to be construed of as their own (Alexiadou and Schäfer 2006; Cruse 1973; Grimm 2007; Kearns 2000). Yet another kind of entity that can serve as a causer external argument is what might be viewed ontologically as an instrument, that is, entities that are used by an sentient entity to accomplish a task (e.g. keys, knives, drills) (Delancey 1984; Schlesinger 1989). Examples of instrument subjects are shown in (6).

(6)   a.   The forklift killed the construction worker.
      b.   The remote control opened the door.
      c.   The key opened the door.
      d.   The knife cut the bread.   (Levin 1994)
      e.   The axe split the log.

In Wolff, Jeon, Klettke and Li (in press), we propose that an entity can be a causer in English and other languages if it acts as a *force creator*. We further argue that there are several ways in which forces can be created, which may explain the relatively wide range of entities that can serve as external arguments. For example, forces can be created through energy conversion, that is, when energy is transformed from one form to another. Forces can also be created when entities come into physical contact with each other or when the direction of a force is changed. These different ways of creating force correspond to different types of causers and

together can be viewed as forming a continuum along which different languages establish their limits on possible external arguments/causers.

1.4.   *Cross-linguistic differences in the appearance of non-agentive entities in the subject position*

Not all languages are as flexible as English with respect to the range of causer external arguments. In fact, the kinds of entities that can serve as external arguments have often been observed to differ across languages (Comrie 1989; Craig 1977; DeLancey 1984; Folli and Harley 2007; Guilfoyle 2000; Hawkins 1985; Wolff and Ventura 2009). For example, it has been suggested that English may allow a much broader range of causer external arguments than Irish, Dutch, German, Russian, Jacaltec, Cora, or Korean (Comrie 1989; Craig 1977; Guilfoyle 2000; Hawkins 1985; Soto 2001; Van Voorst 1996; Wolff and Ventura 2009).

In a discussion of the difference between English and German, Hawkins (1985) proposes how such differences might arise.[2] Hawkins notes that one prominent difference between German and English is the way in which grammatical relations are marked. In English, the grammatical function of a noun within a phrase or clause is indicated by relatively fixed word order and prepositions. German, in contrast, marks grammatical relations with morphological case, that is, morphological attachments or modifications to the noun. Common cases include nominative case (NOM), which indicates the subject of a finite verb; accusative case (ACC), which indicates the direct object of a verb; dative case, which expresses the recipient argument of a verb; and instrumental case, which indicates the object used to perform an action. Like other languages with case systems, German has relatively free word order (Hawkins 1985).

Hawkins (1985; Chapter 4) hypothesized that word order rules interacting with certain pragmatic principles constrain the range of possible subjects in German and English. For example, on the discourse level, it is preferable to position "given" information before "new" information (Lambrecht 1994). This principle is easy to realize in German: whether the given information is found in the direct object or the subject, either can occur initially, marked by the appropriate case (nominative or accusative). This option is not as simply realized in English: since it lacks morphological case marking, its word order is relatively fixed. Because English word order is less flexible, Hawkins (1985) suggests that English might satisfy pragmatic constraints like the given-new principle by allow-

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2.   We thank Beth Levin for making us aware of this idea and pointing us to Hawkins' (1985) work.

ing for a wider range of entities in the subject position, including instrumental subjects. In effect, due to the lack of morphological case, entities that might otherwise receive different case roles are joined together to form a highly heterogeneous category, a process Hawkins refers to as ''case syncretism.'' We propose that Hawkins' proposal be extended to other languages. In languages with morphological case, specific categories of entities can be selected by the morphosyntax of the language and there will be little pressure to combine case categories. As a consequence, the external argument position in causal expressions will largely be reserved for entities that are capable of internal force generation, that is, sentient entities and natural forces. In contrast, languages without morphological case and less rigid word order will tend to allow for a relatively wide range of entities as external arguments.

Our proposal is consistent with Guilfoyle's (2000) division of languages into two types: Type A languages (e.g. Dutch, Irish), which restrict the subject position to entities that can initiate events, that is, mostly intentional agents or natural forces, and Type B languages (e.g. English), which allow any entity in subject position as long as it participates in the causal chain. We will refer to Guilfoyle's Type A languages as initiator languages and Type B languages as non-initiator languages. Interestingly, the initiator languages cited by Guilfoyle have morphological case whereas the one language that she cites as an example of a non-initiating language, English, does not. We suggest, then, that Hawkins' and Guilfoyle's proposals can be aligned. According to what we call the *initiator hypothesis*, the kinds of entities that make good causers depend on the availability of a morphological case system, which in turn may have an impact on the flexibility of a language's word order. Languages with morphological case (e.g. Dutch, Irish) will tend to be more selective about the kinds of entities that can appear as causers; in particular, in initiator languages, the external argument must be able to initiate the causal chain. Languages with little or no morphological case (e.g. English) will tend to be relatively open with respect to the kinds of entities that can appear as external arguments, in part because they do not have the morphosyntax available to encode the constraints, but also possibly because they will be more restrictive about word order, which can lead to the combining of case categories. All that such languages might require is that causers be entities that in some way participated in the causal chain; they need not be the entities that initiated the causal chain.

The initiator hypothesis is supported by the acceptability judgments reported in the literature and by our consultants. As predicted, the sentences in (7) and (8), which have inanimate entities as external arguments of the matrix clause, are acceptable in English, a language without

morphological case, but unacceptable in languages like Dutch, German, and (possibly) Russian, languages that do mark for morphological case.

(7)   The rock broke the windshield.
       #Het steentje heft de voorruit   (Dutch; Alexiadou and Schäfer
       gebroken.   2006; Van Voorst 1996)
       #Der Stein zerbrach die   (German)
       Windschutzscheibe.
       #Kamen' razbil lobovoe   (Russian)
       steklo.
(8)   The key opened the door.
       #D'oscail an eochair an doras.   (Irish; Alexiadou and Schäfer
                                                 2006; Guilfoyle 2000)
       #Desleutel opende de deur.   (Dutch; Alexiadou and Schäfer
                                                 2006; Guilfoyle 2000)
       #Kliuch otkryl dver'.   (Russian; Wolff and Ventura
                                                 2009)
       #Der Schlüssel öffnete die Tür.   (German)

A much stronger test of this hypothesis would be to examine the range of possible external arguments in languages that have not yet been studied in this respect. Two such languages include Korean, which has a case system (Song 1988), and Mandarin Chinese, which does not (LaPolla 1993). Based on our proposal, the range of entities that make acceptable external causer arguments in Chinese should be similar to that in English, which in turn should be greater than the range of entities that make acceptable subjects in Korean. Of course, these predictions would hold only if the kinds of constructions that can be used to describe causation in Korean and Mandarin Chinese are similar to those that can be used in English. In the next two sections, we provide a quick review of the way causal relations are expressed in these two languages. We show that these languages, like English, can describe causal relations with lexical and periphrastic causatives. We then focus on how the semantics of external causer arguments in these languages might compare to the semantics of external causer arguments in English.

1.5.   *Expressing causation in Korean*

Korean and English differ in their morphological systems. In Korean, nouns bear suffixes for case and discourse functions such as topicalization and emphasis. Although the canonical word order in Korean is Subject-Object-Verb, other word orders are possible, and in general, word order in Korean is much more flexible than in English (Bratt 1996). Like

English, however, Korean has both lexical and periphrastic causative expressions, as exemplified in (9) and (10) respectively (Bratt 1996; Song 1988).

(9) Mary-ka   Martha-lul   cwuk-i-ess-ta   (Song 1988)
     Mary-NOM   Martha-ACC   die-CAUS-PAST-DEC
     'Mary killed Martha.'

(10) Mary-ka   Martha-lul   cwuk-key
      Mary-NOM   Martha-ACC   die-ADV
      hay-ss-ta   (Song 1988)
      CAUSE-PST-DEC[3]
      'Mary caused Martha to die.'

As in English, lexical causatives are associated with immediate or direct causation while periphrastic causatives are associated with either direct or indirect causation (Shibatani and Pardeshi 2001; Sohn 2001). The lexical causative in (9) is composed of the intransitive verb *cwuk* 'die' and a causative suffix, *-i*. Some of the lexical causative English are similarly derived. For example, adding the suffix *-en* to the adjective *high* results in the lexical causative *heighten*, or adding the suffix *-ize* to the noun *energy* generates the lexical causative *energize* (see Levin 1994). However, the formation of lexical causatives from suffixation is much more productive in Korean than in English. In addition to the suffix *-i*, lexical causatives can be derived from a number of different suffixes (see Sohn 2001).

According to the initiator hypothesis, languages such as Korean are expected to limit the subjects of causative sentences to entities that can initiate events by generating their own energy. Consistent with this prediction, lexical causatives with inanimate entities in the subject position do not appear to be acceptable in Korean, as exemplified in (11).

(11) #Bawee-ga   chaapyuri-reul   ggae-ss-ta.
      Rock-NOM   windshield-ACC   broke-PST-DEC
      'The rock broke the windshield.'

In Experiment 1, this prediction is tested empirically.

In Korean, the process of creating a periphrastic causative is also very productive (Sohn 2001). They are produced by attaching *–key ha(y)* to the predicate encoding the result, as in (10). The verb stem *ha(y)* is compatible with several meanings, including 'do, make, cause, let, enable, permit, tell, and arrange' (Park 1993; Sohn 2001). The verb stem is

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3. NOM = Nominative case; ACC = Accusative case; ADV = adverbializer; PST = Past tense; DEC = Declarative mood

preceded by the adverbializer –*key*, which roughly means 'so that, to'. As discussed earlier, it is widely agreed that periphrastic causatives in English are biclausal. Periphrastic causatives in Korean can also be given a biclausal analysis; however, they can be given a monoclausal analysis depending on the case assigned to the causee (Bratt 1996).

Of central importance to the initiator hypothesis, periphrastic causatives are largely restricted to interactions between people. For example, the English sentence *Mary caused Martha to die* can be translated into Korean relatively directly (see (10)), but the English sentence *Mary caused the ball to break the vase* cannot, as shown in (12).

(12) #Mary-ka   gong-ege   ggotbyoung-eul ggae-key
      Mary-NOM   ball-DAT   vase-ACC   break-ADV
      hay-ss-ta
      CAUSE-PST-DEC
      'Mary caused the ball to break the vase.'

Clearly, the English version of the sentence in (12) is not one that English speakers would be likely to use, but this is because it represents an overly detailed way of describing such an event, and not because the sentence is semantically anomalous, as it is in Korean. Note that even when the inanimate causee (the ball) is marked with nominative or accusative case, the sentence remains awkward. We propose that the reason why it is unacceptable in Korean is because the causee, *the ball*, is (via indexing) the external argument of embedded clause (Δ *to break the vase*), and hence subject to the same restrictions that limit the range of external arguments in the matrix clause. The sentence in (12) may be unacceptable because balls are not capable of initiating their own actions.

As mentioned above, many periphrastic causative verbs in Korean are compatible with the meanings of several periphrastic causative verbs in English (Park 1993; Sohn 2001). The verb stem *ha(y)* can be translated into English as *cause*, but also sometimes as either *have* or *get*. The translation of the English verb *force* would involve adding the morpheme *kangyo-* to *ha(y)*. Similarly, several of the ENABLE verbs in English have Korean equivalents, including *enable*, *let*, *help*, *allow* and *permit*.

1.6. *Expressing causation in Mandarin Chinese*

Lexical and periphrastic causative expressions are also found in Chinese. Like English, Chinese has a variety of periphrastic causative verbs. Their semantic domains, however, do not exactly line up with their English counterparts. For example, while the Chinese verbs *shǐ* or *shǐde* are probably the most similar to English *cause*, they differ from the English verb

in that they can also be used to encode the notion of ENABLE. In (13) and (14), they would be interpreted as implying CAUSE.

(13) Tāde   huà   shǐ(de)   tā   xiào qǐlái.
     he-*possessive* words CAUSE   her   smile
                                         directional complement
     'His words made her smile.'

(14) Fēng   shǐde   shùzhī   dǎpò   le   chēchuāng.
     Wind   caused tree-branches   break *particle* car-window
     'The wind caused the tree branches to break the car window.'

In Chinese, as in English, the external argument of the embedded clause does not need to be agentive. This is illustrated by (14), in which the causee 'tree-branches' is inanimate. Two other commonly used CAUSE/ENABLE verbs are *jiào* and *ràng* (Shibatani and Pardeshi 2001). As in English, periphrastic causatives in Chinese are biclausal.

Lexical causatives in Chinese are often formed by combining a verb with a complement that indicates the consequence or end result of the verb. For example, the verb *dǎ*, which conveys actions performed using one's hands, can be combined with *pò* 'broken' and *kāi* 'open,' (in (15) and (16) respectively) to form the lexical causatives *dǎpò* 'to (cause to) break' and *dǎkāi* 'to (cause to) open.'

(15) Dìdi   dǎpò   le   huāpíng.
     younger brother break *particle* vase.
     'The younger brother broke the vase.'

(16) Lǐ Míng dǎkāi le   chuānghu.
     Li Ming open   *particle* window
     'Li Ming opened the window.'

As in English, sentences with lexical causatives are monoclausal. Chinese has been described as an "atypical" SVO language (Xu 2006) in that it often uses an SOV word order. In addition, when emphasis is placed on the object, as is often the case in causative constructions, the *ba*-structure is commonly used, and sometimes is the only legitimate form. In a *ba*-sentence, the object is preposed between the subject and the verb: S ba O V, as in (17).

(17) Dìdi   bǎ   huāpíng dǎpò   le.
     younger brother BA   vase   break *particle*.
     'The younger brother broke the vase.'

However, as argued by a number of researchers, describing Chinese as an SVO language is problematic because the grammatical relation of

"subject" in Chinese is quite different from the notion of subject in, for example, English (e.g. LaPolla 1993, 2009; Li and Thompson 1976; Van Valin and LaPolla 1997). As a consequence, it is often said that Chinese is better characterized as having a topic-comment than subject-object structure (e.g. LaPolla 1993, 2009). Like English, Chinese does not have morphological case. Word order in Chinese may be more restricted than in Korean, but due to constructions like the *ba*-structure and a relatively high prevalence of zero anaphora ('missing' arguments), it is possible that word order in Chinese might be more flexible than in English.

1.7.   *Subjects in English, Chinese, and Korean*

According to our initiation hypothesis, the range of entities that can appear in the external argument position should be more restricted for languages with morphological case than for languages without. We would expect, then, that Korean should have more stringent semantic constraints on external argument than either English or Chinese. In particular, in Korean, subjects should be limited to entities that can self-initiate, or generate their own energy. We tested this prediction by asking speakers of English, Mandarin Chinese, and Korean to rate the acceptability of sentences with respect to the external argument's ability to generate its own energy. We predicted that ability to self-generate should be important to each language: that is, sentences with external arguments that can self-energize should be rated as more acceptable than sentences with external arguments that cannot self-energize since ability to initiate is a prototypical feature of external arguments in general (Dowty 1991). However, the key prediction is that the difference between external arguments that can self-generate and those that cannot will be greater in Korean than in English or Chinese. External arguments that cannot self-energize should be unacceptable in Korean, but merely less typical in English and Chinese. These predictions were tested in the following experiment.

2.   Experiment 1: Selection restrictions on causers

Korean, Chinese, and English native speakers rated sentences with respect to the external argument's ability to generate its own energy. All of the external arguments were inanimate since a mixture of animate and inanimate external arguments would have confounded energy generation with animacy. It was expected that all language groups would rate the high self-energizing external arguments as more acceptable than the low self-energizing external arguments, but that the difference would be greater in the case of the Koreans than the Chinese or English speakers.

2.1. *Methods*

2.1.1. *Participants* The English native speakers (N = 18; percent female, 67; average age, 19) were undergraduates attending Emory University; the Chinese native speakers (N = 18; percent female, 69; average age, 40) lived in Taitung, Taiwan, and the Korean native speakers (N = 18; percent female, 33; average age, 26) lived in Seoul, Korea.

2.1.2. *Materials* The materials were 30 sentences with inanimate external arguments. The materials were developed in consultation with native speakers of Mandarin Chinese and Korean to assure that the words used had relatively direct translations in each language. All of the sentences and translations were simple transitive sentences describing a causal interaction, broadly construed, between the external arguments and the object of the sentence; in every sentence, the object underwent a change of state or location as a result of the actions of the external arguments (e.g. *The wave flipped the boat; The bullet killed the president*). The sentences were divided into two groups. Half of the sentences named external arguments that were mostly able to generate their own energy while the remaining sentences contained external arguments which were mostly unable to generate their own energy. Assignment to these two groups was based on the results from a separate rating task in which English speakers ($N = 20$) judged ''the degree to which the affectors [i.e. external arguments] in the sentences were able to generate their own energy/force'' on a 0-to-100 scale.'' In the high energy generation group, roughly half of the external arguments were natural forces and the remaining entities were energy-transforming devices (e.g. microwaves). Of the external arguments naming entities without power sources, the majority were what would be construed as instruments in the linguistics literature. Chinese and Korean translations were checked by additional native speakers in each of these languages. The sentences, along with their Korean and Chinese translations, are provided in Table A in the appendix.

2.1.3. *Procedure* Participants were given booklets containing the 30 sentences in one of four possible orders. At the top of each page was a scale from 0 to 100. Participants were instructed to ''rate how acceptable the sentences are on a 0-to-100 scale (0 = is completely not acceptable; 100 = is perfectly acceptable).'' The English native speakers were tested in a lab setting at Emory University. The Chinese and Korean native speakers were tested in a home setting in their respective countries.
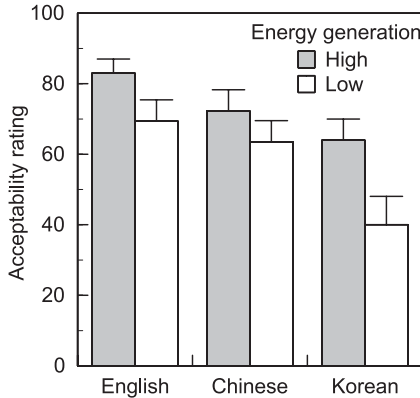
Figure 1.   *Acceptability ratings to sentences in containing external arguments that were either high or low in their ability to generate their own energy; the error bars indicate 95% confidence intervals*

2.2.   *Results and discussion*

There were three main results. First, as shown in Figure 1, there was an overall effect of language across both participants, $F_p(2,51) = 19.83$, p < 0.001, and items, $F_i(2,28) = 46.48$, p < 0.001: acceptability ratings were highest for the English speakers (M = 76.4, SD = 13.2) , followed by the Chinese speakers (M = 67.9, SD = 13.7), and then by the Korean speakers (M = 52.5, SD = 19.8). Bonferroni post hoc analyses indicated that both the English and Chinese acceptability ratings differed significantly from the Korean acceptability ratings, but not from each other, across both participants and items. Second, there was an overall effect of energy generation across both participants, $F_p(1,60) = 71.1$, $p < 0.001$, and items, $F_i(1,28) = 10.58$, $p < 0.01$: sentences with subjects that could generate their own energy ($M = 73.5$, $SD = 13.9$) had higher acceptability ratings than sentences with subjects that could not generate energy ($M = 57.7$, $SD = 19.5$). The difference between high and low energy generation was significant for each of the languages across participants; the difference between high and low energy generation was also significant for English and Korean speakers across items, but there was only a tendency towards significance with the Chinese speakers across items.

The most important finding was a significant interaction between language and energy generation across both participants, $F_p(2,51) = 6.24$, $p < 0.01$, and items, $F_i(2,28) = 10.48$, $p < 0.01$: this interaction reflects that the difference between high and low energy generation for the Korean speakers was greater than the difference between high and low

energy generation for the Chinese and English speakers. In support of this interpretation, when the acceptability ratings of the Koreans were removed, the interaction between language and energy generation was no longer significant across either participants, $F_p(1,34) = 1.62$, $p = 0.212$, or items, $F_i(1,28) = 0.121$, $p = 0.731$. The results from this study support the proposal that external argument selection is more restricted in languages that have morphological case than in languages that do not. Further, the results suggest that a large proportion of the difference between languages can be attributed to whether the external argument is able to self-energize.

The results have implications for the way causal verbs are used to describe causal events. To the extent that the results reflect constraints on external arguments in general, the effects should apply not only to the main external argument of a sentence, but also to the external argument of embedded clauses within a sentence. According to the initiator hypothesis, speakers of English and Chinese should be willing to describe causal chains with periphrastic causative (biclausal) expressions regardless of whether the external arguments of the embedded clause is able to self-energize; in contrast, Korean speakers should only be willing to use biclausal expressions if the external arguments of the embedded clause is able to self-energize. These predictions were tested in the following two experiments. In Experiment 2a, we examined the kinds of scenarios that we expected would be described in essentially the same way by speakers of English, Chinese, and Korean. The point of this experiment was to show that the kinds of constructions being compared across languages have essentially the same meaning for certain kinds of occurrences. In Experiment 2b, we examined the kinds of scenarios that, according to the initiator hypothesis, should lead to differences in linguistic coding across the languages.[4]

3.   Experiment 2a: Constraints on agentive causees

Native speakers of English, Chinese, and Korean were shown animations of causal chains in which a human interacted either directly with an inanimate object or indirectly with another human. Figure 4a shows a single frame from one of the animations that depicted the first type of scenario: here, a woman closes a door by pushing it. There is only one agent (the woman), who is able to initiate her own energy, and the causation is direct. We predicted that speakers of all three languages would describe scenes like this with a lexical causative sentence, as in (18).

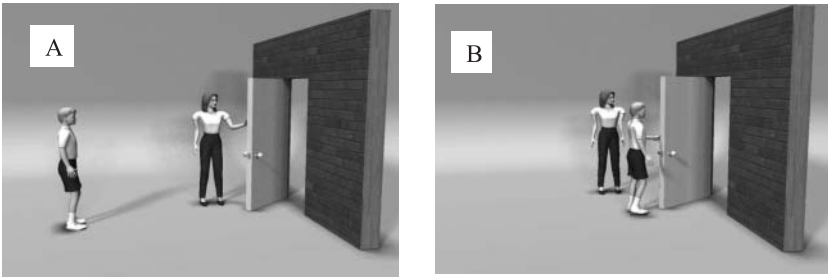4.   The results from these experiments were initially reported in Wolff et al. (2006).

Figure 2.   *Frames from animations depicting (A) direct and (B) indirect causal chains used in Experiment 2a*

(18) a. The mother closed the door.   (English)
      b. māma   guān   shang le   mén.   (Mandarin Chinese)
          Mom   closed   up   door
      c. Umma-ga   mun-eul   dat-atda.   (Korean)
          Mom-NOM   door-ACC   close-PAST.

Figure 4b shows a single frame from an animation that depicted the second type of situation. In these scenarios a human tells another human to do something, that is, these causal chains consisted of two agents, each capable of initiating their own energy. Since the causation in these chains is indirect, we predicted that all three languages would describe such scenes with periphrastic causative descriptions, as in (19).

(19) a. The mother caused the son to close the door.
      b. māma   shǐdé   érzi   guān   shang le   mén
          Mom   cause   son   closed   door
      c. Umma-ga   aadeul-ege   mun-eul   dat-key
          Mom-NOM   son-DAT   door-ACC   close-CAUSE
          haetda.
          do-PAST

3.1. Methods

3.1.1. *Participants*   The English native speakers (N = 16; percent female, 75; average age, 19) were undergraduates attending Emory University; the Chinese native speakers (N = 16; percent female, 50; average age, 20) lived in Taitung, Taiwan, and the Korean native speakers (N = 16; percent female, 56; average age = 26) lived in Seoul Korea.
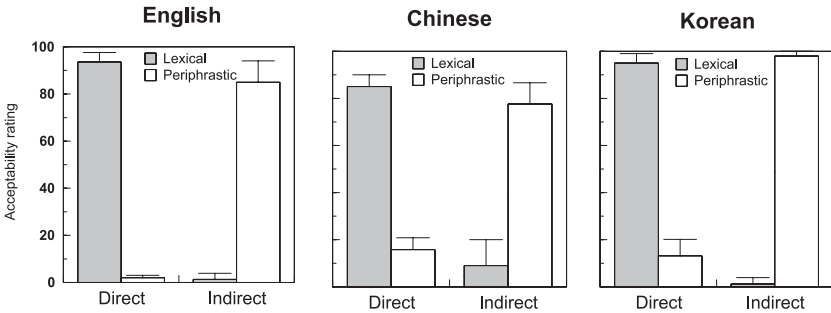
Figure 3. *Experiment 2a acceptability ratings of lexical causatives (single-clausal) and peri-phrastic causatives (bi-clausal) as descriptions of direct and indirect causal chains across languages with 95% confidence intervals*

3.1.2. *Materials* Ten pairs of animations were made using an animation package called Discreet 3D Studio Max version 8. The animations were constructed in pairs like the one shown in Figure 2, with one member of each pair depicting direct causation and the other, indirect causation. Specifically, the animations depicted a mother closing a door or telling her son to close a door; a mother bouncing a ball or telling her son to bounce a ball; a father chipping a block of marble or telling his son to chip a block of marble; a man bending a bow or telling his student to bend a bow; a principal adjusting a clock or telling a student to adjust a clock; a grandmother turning on a lamp or telling her husband to turn on a lamp; a foreman moving a box or telling an employee to move a box; a mother rolling some dough or telling her son to roll some dough; a mother straightening a book or telling her son to straighten a book; and a woman unrolling a rug or telling a man to unroll a rug. The average length of the animations was 4.9 seconds.

3.1.3. *Procedure* The animations were presented in one of four random orders on Windows-based computers. For each animation, participants rated the acceptability of either a lexical causative or a periphrastic causative description of the animation on a 0-to-100 scale (0 = not acceptable; 100 = completely acceptable). The descriptions were tailored to the content of the animation. For example, when English speakers were shown the animations associated with the still frames shown in Figure 2, they rated the acceptability of (18a) and (19a). The Chinese and Korean speakers chose from translations of the same sentences, also as shown in

(18) and (19). Participants indicated their answers by typing in a number next to each sentence. The English native speakers were tested in a lab setting at Emory University, while the Korean and Chinese native speakers were tested in a home setting in their respective countries.

3.2. *Results and discussion*

The results were analyzed using a mixed factor ANOVA in which directness (direct vs. indirect) and construction (lexical vs. periphrastic) were run within participants and language type (English, Chinese, Korean) was run between participants; for the item analyses, all three factors were run within items.

As predicted, all language groups preferred lexical causative expressions for animations depicting direct causation and periphrastic causative expressions for the animations depicting indirect causation (see Figure 3), as supported by a significant interaction between the directness of the causation (direct vs. indirect) and the type of construction (lexical vs. periphrastic) across both participants, $F_p(1,45) = 1651.63$, $p < 0.001$, and items, $F_i(1,9) = 3954.76$, $p < 0.001$. The 3-way interaction between directness, construction, and language was also significant across participants $F_p(2,45) = 12.99$, $p < 0.001$ and items, $F_i(2,18) = 4.75$, $p < 0.001$, but as shown in Figure 5, it was not associated with a qualitative difference in the nature of the interaction between directness and construction across languages. The only other factor that was significant across both participants and items was directness: the responses to direct animations ($M = 48.42$, $SD = 6.25$) were slightly higher than responses to indirect animations ($M = 45.4$, $SD = 10.1$), $F_p(1,45) = 4.92$, $p < 0.05$, $F_i(1,9) = 6.19$, $p < 0.05$. No other main effects or interactions were significant. In sum, the results support the hypothesis that self-initiating agents can serve as external arguments of both main and embedded clauses in English, Chinese, and Korean.

4.   **Experiment 2b: Constraints on non-agentive causees**

In the second part of the study, we examined scenarios that we predicted would differ across languages. In these scenarios, the causal chains included intermediate entities that were inanimate. The animations were again constructed in pairs, this time differing with respect to whether or not the intermediate entity was fully under the control of the initial human agent. For example, in Figure 4a, a girl throws a ball at a vase and breaks it. Because the ball's motion is controlled by the girl, we predicted that the participants, regardless of their language, would view the causa-
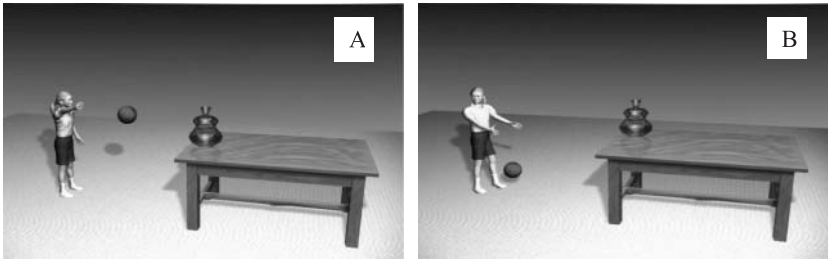
Figure 4. *Frames from animations depicting (A) direct and (B) indirect causal chains used in Experiment 2b*

tion as direct, and hence prefer to describe the chain with a lexical causative expression, as in (20).

(20) a. The girl broke the vase.
      b. nǔhái dǎpò le huāping   (Mandarin Chinese)
          Girl   broke   vase
      c. Sonyeo-ga ggotbyoung-eul ggaetda.   (Korean)
          Girl-NOM   vase-ACC   broke-PAST

In Figure 4b, in contrast, the girl accidently bounces a ball off her foot, and the ball hits the vase, breaking it. Because the ball's actions are not under the control of the girl, the causal chain should be viewed as indirect and so elicit periphrastic causative expressions. For the English and Chinese speakers, this is straightforward: the ball can be viewed as an intermediate causer, or participant in the causal chain, and hence qualifies as an external argument in the embedded clause. However, for the Korean speakers, a periphrastic causative expression should not be acceptable since, in Korean an external argument must be able to generate force. As a consequence, Koreans should find it unacceptable to use the ball as an external argument of the embedded clause in a periphrastic causative. In sum, we predicted that English and Chinese but not Korean speakers would be able to describe the scene depicted in Figure 4b with a periphrastic causative, as shown in (21).

(21) a. The girl caused the ball to break the vase.
      b. nǔhái shǐdé   qiú   dǎpò le huāpíng
          Girl   caused ball broke   vase
      c. *Sonyeo-ga gong-ege ggotbyoung-eul ggae-ge
          Girl-NOM ball-DAT vase-ACC   break-CAUSE
          haetda.
          do-PST-DEC

4.1.   Methods

4.1.1.   *Participants*   The participants were the same as in Experiment 2a.

4.1.2.   *Materials*   Ten pairs of animations were constructed like the one in Figure 4, with one member of each pair depicting direct causation and the other, indirect causation. Specifically, the animations depicted a girl throwing a ball or accidently bouncing a ball off her foot into a vase which then broke; a girl popping a balloon by stabbing it with a pencil or by accidently positioning it under an overhead light, causing it to pop; a man placing butter into a frying pan on a lit stove or next to the stove, causing it to melt; a man collapsing a house of cards by deliberately slamming down a playing card on top of it or accidently when trying to carefully place another card on the house; a woman dimming the lights by pushing down a light dimmer or turning on a toaster; a woman spraying a lit candle with a water gun or opening a window and allowing wind to extinguish the candle; a woman waving her hand towards a smoking cigarette or walking past a smoking cigarette, dispersing the smoke; a man making a flag flutter by moving it back-and-forth or lifting it above a wall and bringing it into contact with wind; a woman hitting a window with a stick or slamming the window pane down, causing the glass to crack. The average length of the animations was 5.8 seconds.

4.1.3.   *Procedure*   The procedure was the same as in Experiment 2a. As before, participants rated the acceptability of either a lexical causative or a periphrastic causative description of the animation on a 0-to-100 scale (0 = not acceptable; 100 = completely acceptable).

4.2.   Results and discussion

The results were analyzed using a mixed factor ANOVA in which directness (direct vs. indirect) and construction (lexical vs. periphrastic) were run within participants and language type (English, Chinese, Korean) was run between participants, while all three factors were run within items in the item analyses.

As in Experiment 2, there was a significant interaction between directness and construction: participants preferred to use lexical causatives for animations depicting direct causation and periphrastic causative constructions for animations depicting indirect causation (see Figure 5); the interaction was significant across both participants, $F_p(1,45) = 177.3$, $p < 0.001$, and items, $F_i(1,9) = 18.98$, $p < 0.01$. Of particular interest in this experiment was in how the different constructions were used. As pre-
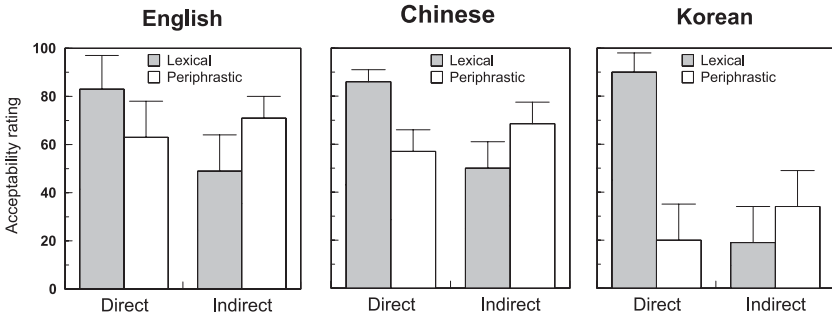
Figure 5.   *Acceptability ratings from Experiment 2b along with 95% confidence intervals*

dicted, acceptability ratings for periphrastic causatives differed across languages. In English and Chinese, participants were willing to use periphrastic causatives to describe the indirect causal chains; specifically, they were willing to use expressions in which the external argument of the embedded clause named an inanimate entity. Korean speakers, on the other hand, resisted periphrastic causatives in this way, presumably because in Korean, an entity that cannot generate its own energy cannot appear as an external argument, even as the external argument of an embedded clause. This difference across the languages was indicated by a interaction between construction and language that was significant across both participants, $F_p(1,45) = 23.3$, $p < .001$, and items, $F_i(2,18) = 23.89$, $p < 0.001$. Providing further support for the initiator hypothesis was the occurrence of a main effect of language: the overall level of acceptability ratings in Korean ($M = 40.87$, $SD = 7.65$) was lower than in the other two languages, English ($M = 62.85$, $SD = 13.15$) and Chinese ($M = 64.13$, $SD = 10.13$), which virtually did not differ from each other, $F_p(2,45) = 24.54$, $p < .001$, $F_i(2,18) = 49.34$, $p < 0.001$. The findings support the hypothesis that with respect to inanimate causer subjects, English and Chinese are more similar to each other than either is to Korean.

Other aspects of the results were unsurprising. As in Experiment 2a, acceptability ratings animations depicting direct causation ($M = 61$, $SD = 13.31$) were higher than those depicting indirect animations ($M = 50.9$, $SD = 18.33$), $F_p(1,45) = 39.68$, $p < 0.001$, $F_i(1,9) = 6.25$, $p < 0.05$. Finally, unlike in Experiment 2a, acceptability ratings for lexical causatives ($M = 68$, $SD = 13.24$) were higher than for periphrastic causatives ($M = 43.86$, $SD = 27.78$), $F_p(1,45) = 54.584$, $p < 0.001$, $F_i(1,27) = 19.823$, $p < .01$. No other main effects or interactions were significant.

The results from this study provide further evidence for the proposal that the kinds of entities that can serve as external arguments in English

and Chinese differ from the kinds of entities that can serve as external arguments in Korean.

Given that the semantics of external arguments must be constantly invoked when using language, it is possible that it might have an impact on the way people think about causal events. According to Davidson (2001), people individuate events with respect to causal agents (see also Wolff 2003). Given that the semantics of causal agents differs across languages, the way events are individuated across languages might differ as well. In particular, speakers of English and Chinese might be more likely than speakers of Korean to view causal chains with inanimate intermediaries as instantiating two events. This possibility was investigated in the next experiment.

5.   Experiment 3: Event individuation across languages

We investigated the potential impact of external argument selection on the individuation of events by examining how speakers of English, Korean, and Chinese speakers construed the animations used in Experiment 2a and 2b in terms of events. Event individuation was measured by having participants map the animations onto drawings depicting either one or two arrows. Our assumption was that if the animation was construed as a single event, then the probability of choosing a single arrow would increase. We used this mapping task as opposed to explicitly asking participants whether the animation could be construed as a single event to minimize the potential biasing effects of language. For example, if we had asked participants whether an animation depicted a ''single event'', differences across languages might be due to subtle differences in the meaning of the word "event" and its translation across languages.

5.1.   *Methods*

5.1.1.   Participants   The English native speakers (N = 16; percent female, 70; average age, 19) were undergraduates attending Emory University; the Chinese native speakers (N = 16; percent female, 69; average age, 30) lived in Taitung, Taiwan, and the Korean native speakers (N = 16; percent female, 38; average age = 31) lived in Seoul, Korea.

5.1.2.   Materials   The materials were the same animations used in Experiments 2a and 2b. In ten of the pairs, the intermediary in the indirect chains was a person while in the remaining ten pairs the intermediary was an inanimate object.
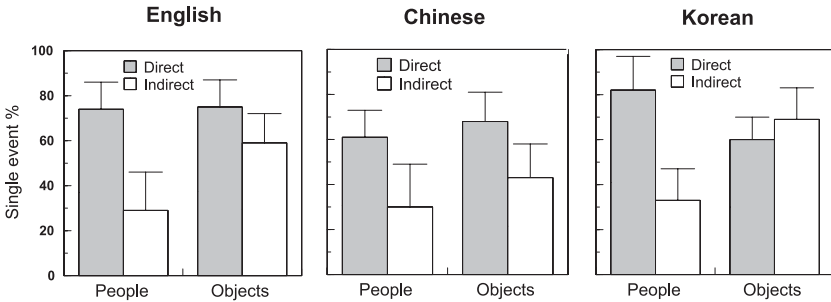
Figure 6.   *Single event judgments in Experiment 3 with 95% confidence intervals*

5.1.3.   *Procedure*   The animations were presented on Windows-based computers in a different random order for each participant. Below each animation were two figures. One of the figures showed a single arrow pointing to the right. Placed on top of the arrow were two small pictures, one of which showed the initiating causer in the animation (e.g. a girl) while the other showed the final entity in the chain (e.g. a vase). The second figure showed two separate arrows, each pointing toward the right. On top of each arrow were the same two pictures that were placed on the single arrow. Participants were instructed to ''Select the figure that best represents what happened in the animation''. Participants indicated their answers by clicking one of the radio buttons located next to the figures. The English native speakers were tested in a lab setting at Emory University, while the Korean and Chinese native speakers were tested in a home setting in their respective countries.

5.2.   *Results and discussion*

The results were analyzed using a mixed factor ANOVA in which directness (direct vs. indirect) and intermediary (people vs. object) were run within participants and language type (English, Chinese, Korean) was run between participants, while for the item analyses, directness was run within items and language and intermediary were run between items.

As shown in Figure 6, participants in all three languages preferred a single arrow (implying one event) for the direct chains ($M = .69$, $SD = .181$) and two arrows (implying two events) for the indirect chains ($M = .44$, $SD = .206$), as indicated by significant effect of directness across both participants, $F_p(1,45) = 37.56$, $p < .001$, and items, $F_i(1,54) = 68.72$, $p < 0.001$. This result is consistent with previous research showing a relationship between event judgments and directness of causation

(Wolff 2003). It is interesting to note that there was a significant interaction between the directness of the causation and the nature of the intermediary (in the indirect causal chains), $F_p(1,45) = 15.04$, $p < .001$, $F_i(1,54) = 24.22$, $p < 0.001$.

As shown in Figure 6, for animation pairs in which the intermediary was a person, single event judgments were much higher for direct than for indirect causal chains; this was still the case when the intermediary was an object, but the size of the difference was smaller. Of central interest, the interaction between directness and intermediacy differed across languages, as indicated by a significant 3-way interaction between directness, intermediacy, and language, $F_p(2,45) = 3.59$, $p = .036$, $F_i(2,54) = 6.009$, $p = 0.004$. As shown in Figure 6, this 3-way interaction was in large part driven by the event judgments of the Koreans: whereas single event judgments for object intermediaries were higher for direct than indirect causal chains in English and Chinese, no such difference was observed in the Koreans. As shown in Figure 6, the Koreans gave relatively high event judgments for both direct and indirect causal chains when the intermediary was an object. As suggested before, the reason may be because the Koreans did not view the object intermediary as an intervening causer, and as a consequence, construed the entire chain as a single event, while English and Chinese participants could not. In sum, the results support our conjecture that linguistic constraints on the nature of causal subjects might have an impact on the way the speakers of different languages individuate a causal chain into events.

In addition to the findings discussed above, there was also an effect of intermediary: animations in which the intermediary was an object were viewed as single events ($M = 61$, $SD = .217$) more often than when the intermediary was a person ($M = 51$, $SD = .224$), $F_p(1,45) = 7.186$, $p = .01$, $F_i(1,54) = 14.002$, $p < 0.001$. This is consistent with the idea that people individuate events with respect to causers, and people make stronger causers than objects. No other main effects or interactions were significant across either participants or items.

6.   General discussion

The results from three experiments supported the initiator hypothesis. In particular, in initiator languages, such as Korean, external arguments must be capable of generating their own energy while in non-initiator languages, such as English and Chinese, external arguments need only play a role in the causal chain. The hypothesis was supported by the results in three experiments. In Experiment 1, we observed that the acceptability of inanimate entities as causers depended on the ability of the external

argument-referent to generate its own energy; this effect was much stronger in Korean than in English and Chinese, showing that the possible range of causer external arguments in Korean is more restricted than in English and Chinese. In Experiment 2, we showed that the kinds of causal interactions that could be expressed with periphrastic causatives differed across the two language types; in particular, whereas English and Chinese speakers were willing to use periphrastic causatives with inanimate causees, Korean speakers were not, implying, once again, that external arguments are more restricted in Korean than in English and Chinese. In Experiment 3, we found that English and Chinese speakers differed from Korean speakers in the way they decomposed causal chains into events when the intermediaries were inanimate objects, but not when the intermediaries were people. Thus, event judgments mirrored linguistic descriptions in the three languages, raising the possibility that the difference in event judgments might be driven by language.

The results from Experiment 3 are consistent with a Whorfian effect because participants were not instructed or required to encode the events in words. However, it is certainly possible that people may have spontaneously generated such expressions; if they did, it would be an interesting example of how language can serve as a tool in the alignment of abstract relational material (Gentner 2003). One reason why the results in Experiment 3 are particularly interesting is that they address one of the confounds that are often present in research examining the potential impact of language on thought, namely, that performance on some ''non-linguistic'' task is associated with a difference in language as well as in culture (Casasanto 2005). Researchers have often treated people from China, Japan, and Korea as members of a larger East Asian culture, as opposed to a European American culture (Nisbett et al. 2001). Interestingly, in Experiment 3 the results from the different languages did not group by East Asian versus European American culture, but rather with respect to whether the participants spoke an analytic (Chinese or English) versus synthetic language (Korean). We cautiously suggest, then, that to the extent that the results indicate a difference in non-linguistic thought or thinking for speaking, the results might be due most directly to similarities and differences in the languages than to similarities and differences in the cultures.

In our analysis of Korean and Chinese, we observed that these languages have near translations of many of the periphrastic causative verbs in English (e.g. *cause, make, force, get, allow, enable*), suggesting that the various languages make many of the same fine-level semantic distinctions. Wolff et al. (2005) observed that similar inventories of periphrastic causative verbs are also present in German, Spanish, Russian, and Arabic.

Given that causal verbs are picking up on the same kinds of distinctions across languages (e.g. *cause* vs. *force*), it appears then that the meanings of these verbs are probably quite similar across languages, possibly because they are based on clusters of correlated features in the world. The meaning associated with individual verbs may represent those parts of the general conceptual system that overlap with the concepts in the lexicon. That said, while the meanings of the verbs across languages might be much the same, the way the verbs are used can differ, and the differences appear to be produced by the way the semantics of the verbs interacts with the semantics associated with each language's grammar (see Wolff and Ventura 2009). The results in this paper speak to commonalities in the lexicalization of the event conceptualizations, but also how these commonalities are mediated by the syntax-semantics mapping constraints of a speaker's grammatical system.

Appendix

Table A1. *English, Korean, and Chinese sentences used in Experiment 1*

Energy generation	English	Korean	Chinese
High	The air conditioner cooled the room.	에어컨이 방을 식혔다.	空調冷卻了房間
	The alarm clock awoke the kids.	알람시계가 아이들을 깨웠다.	鬧鐘叫醒了孩子們
	The burner warmed the coffee.	버너가 커피를 데웠다.	爐子加熱了咖啡
	The candle brightened the room.	양초가 방을 밝혔다.	蠟燭照亮了房間
	The dishwasher shook the dishes.	식기세척기가 그릇을 흔들었다.	洗碗機搖動了盤子
	The electric kettle boiled the water.	전기주전자가 물을 끓였다.	電子熱水瓶燒開了水
	The eye glasses magnified the words.	안경이 단어를 확대시켰다.	眼鏡放大了字
	The falling stick broke the car window.	떨어지는 막대기가 차창문을 부수었다.	掉下來的樹枝打破了車窗
	The fire burnt the house.	불이 집을 태웠다.	火燒掉了房子
	The heat melted the butter.	열이 버터를 녹였다.	高溫融化了奶油
	The match melted the ice.	성냥이 얼음을 녹였다.	火柴融化了水
	The microwave defrosted the meat.	전자레인지가 고기를 해동시켰다.	微波爐解凍了肉
	The sugar sweetened the cupcake.	설탕이 컵케익을 달게 했다.	糖甜了小蛋糕
	The sunlight dried the towel.	햇빛이 수건을 말렸다.	陽光曬乾了毛巾
	The wave flipped the boat.	파도가 배를 뒤집었다.	浪濤打翻了船
Low	The knife cut the bread.	칼이 빵을 잘랐다.	刀子切了麵包
	The key locked the door.	열쇠가 문을 잠궜다.	鑰匙鎖上了門
	The chopsticks squashed the noodle.	젓가락이 국수를 눌러 으깼다.	筷子捏扁了麵條
	The spoon moved the ice cream.	숟가락이 아이스크림을 옮겼다.	湯匙移動了冰淇淋
	The cork screw opened the bottle.	코르크 병따개가 뽑이가 병을 열었다.	開瓶器打開了瓶子
	The hanger dropped the shirt.	옷걸이가 셔츠를 떨어뜨렸다.	衣架掉了襯衫
	The high heels scuffed the floor.	구두가 바닥을 긁었다.	高跟鞋刮傷了地板
	The jacket warmed the boy.	재킷이 소년을 따뜻하게 했다.	夾克溫暖了男孩
	The kettle boiled the tea.	주전자가 차를 끓였다.	熱水瓶燒開了水
	The calculator computed the velocity.	계산기가 속력을 계산했다.	電腦算出了速度
	The keyboard finished the paper.	키보드가 레포트를 끝냈다.	鍵盤完成了報告
	The bullet killed the president.	총알이 대통령을 죽였다.	子彈殺死了總統
	The magnifying glass ignited the fire.	돋보기가 불을 붙였다.	放大鏡點燃了火
	The milk filled the glass.	우유가 컵을 채웠다.	牛奶裝滿了杯子
	The switch brightened the room.	스위치가 방을 밝혔다.	開關亮了房間

References

Alexiadou, Artemis & Florian Schäfer. 2006. Instrument subjects are agents or causers. In Donald Baumer, David Montero & Michael Scanlon (eds.), *Proceedings of the 25th West Coast conference on Formal Linguistics*, 40–48. Somerville, MA: Cascadilla Proceedings Project.

Achard, Michel. 2001. Causation, constructions, and language ecology: An example from French. In Masayoshi Shibatani (ed.), *The grammar of causation and interpersonal manipulation,* 127–156. Philadelphia: John Benjamins.

Baron, Naomi S. 1977. *Language acquisition and historical change*. New York: North-Holland.

Bratt, Elizabeth O. 1996. *Argument composition and the lexicon: Lexical and periphrastic causatives in Korean*. Stanford, CA: Stanford University doctoral dissertation.

Casasanto, Daniel. 2005. Crying "Whorf". *Science* 307. 1721–1722.

Comrie, Bernard. 1989. Language universals and linguistic typology, 2nd edn. Chicago: University of Chicago Press.

Craig, Colette C. 1977. *The structure of Jacaltec*. Austin: University of Texas Press.

Cruse, D. Alan. 1973. Some thoughts on agentivity. *Journal of Linguistics* 9. 11–13.

Davidson, Donald. 2001. *Essays on actions and events*. Oxford: Oxford University Press.

Delancey, Scott. 1984. Notes on agentivity and causation. *Studies in Language* 8. 181–213.

Dowty, David R. 1991. Thematic proto-roles and argument selection. *Language* 67. 547–619.

Fillmore, Charles J. 1968. The case for case. In Emmon Bach & Robert Thomas Harms (eds.), *Universals in Linguistic Theory,* 1–88. New York: Holt, Rinehart and Winston.

Folli, Raffaella & Heidi Harley. 2007. Teleology and animacy in external arguments. *Lingua* 118. 190–202.

Gentner, Dedre. 2003. Why we're so smart. In Dedre Gentner & Susan Goldin-Meadow (eds.), *Language in mind: Advances in the study of language and thought*, 195–236. Cambridge, MA: The MIT Press.

Grimm, Scott. 2007. The bounds of subjecthood: Evidence from instruments. *Berkley Linguistics Society* 33.

Guilfoyle, Eithne. 2000. Tense and N-features in Modern Irish. In Andrew Carnie & Eithne Guilfoyle (eds.), *The syntax of verb initial languages*. Oxford: Oxford University Press.

Hawkins, John A. 1985. *A comparative typology of English and German: Unifying the contrast.* Austin: University of Texas Press.

Jackendoff, Ray & Peter W. Culicover. 2003. The semantic basis of control. *Language* 79(3). 517–556.

Kearns, Kate. 2000. *Semantics*. London: Macmillan Press.

Kwon, Nayoung & Maria Polinsky. 2006. Object control in Korean: Structure and processing. In Naomi McGloin & Junki Mori (eds.), *Japanese/Korean linguistics* 15, 249–262. Chicago, IL: Center for the Study of Language and Information (CSLI).

Lambrecht, Knud. 1994. *Information structure and sentence form: Topic, focus, and the mental representation of discourse referents* (Cambridge Studies in Linguistics 71). Cambridge: Cambridge University Press.

LaPolla, Randy J. 1993. Arguments against 'subject' and 'direct object' as viable concepts in Chinese. *Bulletin of the Institute of History and Philology* 63. 759–813.

LaPolla, Randy J. 2009. Chinese as a topic-comment (not topic-prominent and not SVO) language. In Janet Xing (ed.), *Studies of Chinese linguistics: Functional approaches*, 9–22. Hong Kong: Hong Kong University Press.

Li, Charles & Sandra Thompson. 1976. Subject and topic: A new typology of language. In Charles Li (ed.), *Subject and topic*. New York, NY: Academic Press.

Levin, Beth. 1994. *English verb classes and alternations: A preliminary investigation*. Chicago, IL: University of Chicago Press.

Levin, Beth & Malka Rappaport Hovav. 1995. *Unaccusativity: At the syntax lexical semantics interface*. Cambridge, MA: MIT Press.

Levin, Beth & Malka Rappaport Hovav. 2005. *Argument realization*. Cambridge: Cambridge University Press.

Levin, Beth & Malka Rappaport Hovav. in press. Lexical conceptual structure. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An international handbook of natural language meaning*. Berlin & New York: Mouton de Gruyter.

Nisbett, Richard E., Incheol Choi, Ara Norenzayan & Kaiping Peng. 2001. Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review* 108. 291–310.

Park, Ki-seong. 1993. *Korean causatives in role and reference grammar*. Buffalo, NY: State University of New York at Buffalo Master's thesis.

Pinker, Steven. 1989. *Learnability and cognition: The acquisition of argument structure*. Cambridge, MA: MIT Press.

Polinsky, Maria & Eric Potsdam. 2003. Backward control: Evidence from Malagasy. In Andrea Rackowski & Norvin Richards (eds.), *Proceedings of the eighth meeting of the Austronesian Formal Linguistics Association*, 257–272. Cambridge, MA: MITWPL.

Radford, Andrew. 1988. *Transformational grammar: A first course*. Cambridge: Cambridge University Press.

Radford, Andrew. 1997. *Syntactic theory and the structure of English: A minimalist approach*. Cambridge: Cambridge University Press.

Schlesinger, I. M. 1989. Instruments as agents: On the nature of semantic relations. *Journal of Linguistics* 25. 189–210.

Shibatani, Masayoshi. 1976. The grammar of causative constructions: A conspectus. In Masayoshi Shibatani (ed.), *Syntax and semantics 6: The grammar of causative constructions,* 1–40. New York: Academic Press.

Shibatani, Masayoshi, & Prashant Pardeshi. 2001. The causative continuum. In Masayoshi Shibatani (ed.), *The grammar of causation and interpersonal manipulation,* 85–126. Philadelphia: John Benjamins.

Sohn, Ho-Min. 2001. *The Korean language*. Cambridge: Cambridge University Press.

Song, Seok C. 1988. *Explorations in Korean syntax and semantics*. Berkeley: University of California, Institute of East Asian Studies.

Song, Grace & Phillip Wolff. 2005. Linking perceptual properties to the linguistic expression of causation. In Michel Achard & Suzanne Kemmer (eds.), *Language, culture, and mind*, 237–250. Stanford, CA: CSLI Publications.

Soto, Verónica V. 2001. Some constraints on Cora causative constructions. In Masayoshi Shibatani (ed.), *The grammar of causation and interpersonal manipulation*, 197–244. Philadelphia: John Benjamins.

van Voorst, Jan. 1996. Some systematic differences between Dutch, French, and English transitive constructions. *Language Sciences* 18. 227–245.

VanValin, Robert D. & Randy LaPolla. 1997. *Syntax: Structure, meaning and function*. Cambridge: Cambridge University Press.

Wierzbicka, Anna. 1988. *The semantics of grammar*. Amsterdam: John Benjamins.

Wolff, Phillip. 2003. Direct causation in the linguistic coding and individuation of causal events. *Cognition* 88. 1–48.

Wolff, Phillip, Ga-hyun Jeon & Kathy Yeh. 2006. Causal agents and the individuation of events in English, Chinese, and Korean. In *Proceedings of the 5th international conference on Cognitive Science*, 213–214. Mahwah, NJ: Lawrence Erlbaum.

Wolff, Phillip, Ga-hyun Jeon, Bianca Klettke & Yu Li. in press. Force creation and possible causers across languages. In Barbara Malt & Phillip Wolff (eds.), *Words and the world: How words capture human experience*. Oxford: Oxford University Press.

Wolff, Phillip, Bianca Klettke, Grace Song & Tatyana Ventura. 2005. Categories of causation across cultures. In Woo-kyoung Ahn, Robert L. Goldstone, Bradley C. Love, Arthur Markman & Phillip Wolff (eds.), *Categorization inside and outside of the lab: Festschrift in honor of Douglas L. Medin,* 29–48. Washington, DC: American Psychological Association.

Wolff, Phillip & Tatyana Ventura. 2009. When Russians learn English: How the semantics of causation may change. *Bilingualism: Language and Cognition* 12(2). 153–176.

Xu, Dan. 2006. *Typological change in Chinese syntax*. New York: Oxford University Press.